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SOME ASSUMPTIONS ON FACTORS FOR FOOD PRODUCTION EFFICIENCIES IN CROPS

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Some assumptions are put forth on the basic factors determining food production efficiencies in crop plants. Beside the requirements for optimum photosynthesis and the form of production determined by the specific characteristics of the plant, the ultimate efficiency may depend on (1) distance from primary production in terms of the physiological stage yielding food, (2) nature of bearing in terms of relation of edible matter to total plant production, and (3) the nature of food material in terms of the chemical complexity of its major constituents. The data are presented as bases of the assumptions made, some implications discussed and the priorities in crops suggested for experimental verification, research and extension for effective increases in food production.

The sixties in India have witnessed an excitement among the agricultural scientists. The wide publicity of the discovery of the high yielding characters of new strains, first in Mexico, focussed attention on wheat and later, following the developments in U.S.A. and in Philippines, on millets and rice respectively. Research for the greatest part has continued on these cereals, with exhortations off and on for work on legumes and other crops. Lately there has, however, been a

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spurt of activity on soybean, backed by serious promotional campaigns on its importance as a protein-cum-oil crop. Sugarbeet is also often being presented as an efficient short-term sugar crop. An objective approach should necessarily take into account the socio-economic implications of introduction of new technology-oriented exotic crops in competing with the already established crops within the country, more particularly in the the absence of relevant integrated technology locally available. A serious study in this direction would expose also the motives of the vested interests from the technologically developed countries who are actively assisting such programmes through various agencies and experts.

The scientists, however, show a disdain for the socio-economic and political implications and get involved in new programmes from their concern, among other things, with the exigencies of food problem in the country. Since claims are made for the superiority of this or that crop, the need for their systematic and integrated appraisal is commonly obvious. Besides, fundamentally also it seems pertinent to take into account the plant factors, the bio-characteristics of the plants themselves, which could form sound bases for choice of crops for the desired purposes involving the most efficient production systems. An analysis of such factors is made in the following.

Food yields and productivity

The average yields of food crops, included in this paper, are official figures as available in FAO records. Food or edible material is that part of the plant which is used without further separation or classification of a major nature, *e.g.* wheat grains and potato tubers as such, sugar from sugarcane or sugarbeet, rice after dehusking paddy, groundnut without shells etc. etc. The dry matter, calories and protein values are calculated from standard tables. The total bio-production is the sum total of edible plus non-edible matter produced in the plant.

Different crops have different spans of life on land from sowing till harvest of the specific food product. Therefore, a practical comparison between different food crops is possible only by comparing their production efficiencies or productivities per day per hectare. This value is obtained from dividing

TABLE 1

Average Yields of Food Crops in India

Average Indian crop yields (FAO Production Year Book-1968) and the calculated yields of edible dry matter, calories and protein are given per hectare, along with their productivity per day.

Food crop (days on land)	Production Per Hectare				Productivity/Day/Hectare		
	Crop yield (kg)	Edible dry matter (kg)	Calories (1×10^6)	Protein (kg)	Edible dry matter (kg)	Calories (1×10^3)	Protein (kg)
Wheat (150)	890	780	3.08	107	5.2	20.5	0.7
Paddy/Rice (130)	1,550/1,085	950	3.75	76	7.3	28.8	0.6
Peas (120)	600	500	2.04	120	4.2	17.0	1.0
Chickpea (140)	450	400	1.62	77	2.9	11.6	0.7
Potato (100)	7,400	1,850	7.15	118	18.5	71.0	1.2
Sweet potato (130)	7,700	2,210	8.32	83	17.0	64.0	0.6
Cassava (300)	13,300	4,350	17.00	75	14.5	56.7	0.3
Sugarcane (300)	47,600	9,520	38.08	—	31.7	126.9	—
Groundnut with/without shell (120)	770/540*	500	2.97	135	4.2	24.8	1.1
Rapeseed (110)	410*	380	2.22	90	3.7	20.2	0.8

* Edible oil yields from groundnut and rapeseed are 270 and 160 kg/hectare respectively.

harvest by the number of days a crop
upies the land from sowing onwards.

From the data on Indian yields (Table 1),
rcane is apparently most productive for
l calories, but it yields only sugar which is
ant for very restricted use and, therefore,
a non-versatile material. Among other
s for food calories from materials of versa-
nature, potato, sweet potato and cassava
ear to be better than wheat, rice and
andnut, and the latter better than pulses.
food proteins, potato, groundnut and
s are better than cereals and root crops ;
for edible oil, groundnut is the major
k.

For a rational comparison, one can rightly
stion the validity of data from a country
India with extremely wide variables in
ironments of soil, topography and climate.
refore, for sound premises, data from
Netherlands, a small region of practically
nogeneous environs, are presented in
le 2. In this region also, potato happens
e the best crop both for food calories and
edible dry matter; next is sugarbeet, but
ding only sugar; wheat and peas show
difference between them, the green peas
g slightly less efficient only in respect
calories. For food proteins, green peas
best, followed by dry peas and then by
at and potato.

In an attempt to understand the reasons
differences in the productivity, the charac-
stics of these plants are analysed in the
owing.

In potato crop, the edible material is whole
he underground tuber, a vegetative tissue
prising mostly of reserve starch. In case
sugarbeet, although the edible material
ar) is contained in an underground vege-
ve tissue, it forms only a part of the storage
whole of which is not edible. Both in
at and peas, the edible seeds containing
ous reserve materials are storage organs,
ted and developed during the final stages
lant cycle following flowering and fertili-
n, and are borne above-ground intricately
stalky supporting material. Between the
n and dry peas, former are products of
early stages in seed development in a mature but photosynthetically active plant, rather than of later stages of a senescing plant as in dry peas.

This analysis can now be elaborated into the following generalisations.

General deductions and assumptions

There is no doubt that the overall form of production and accumulation of reserve material, used as food, must be determined by the evolutionary nature of plant species, under reference. However, once the plant nutrients and solar energy are adequately available along with an abundant leaf canopy for optimal photosynthesis, the relative production efficiencies would to a great extent depend on the physiological stage, purpose and nature of plant bio-production. In this context, the following assumptions are possible regarding the basic factors determining the efficiency of food production. (1) Distance from primary production in terms of the physiological stage yielding food; (2) nature of bearing in terms of relation of the amount of food produced to total bio-production; and (3) nature of food material in terms of the chemical complexity of its major constituents. Obviously, not the individual factors, but an interplay of the three would ultimately determine the total efficiency.

The first assumption, presented in figure 1, can be restated as follows. When the plant grows and undergoes qualitative transformation from one physiological stage into

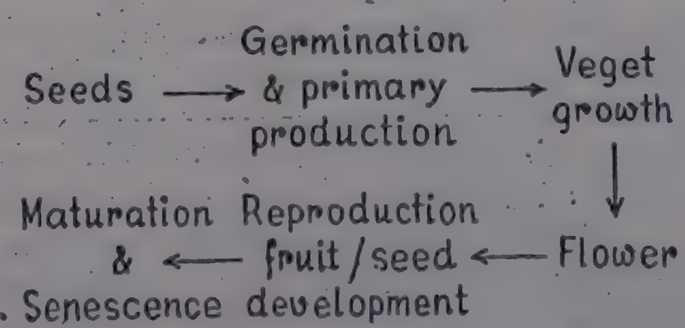

Fig. 1.

another, the increasing multiplicity and complexity of metabolic processes would invariably involve conversion losses in the intermediary

products formed during growth and successive qualitative transformations, and they would necessarily be reflected in decreasing relative production efficiencies with increasing distance from primary production. For example, the highest efficiencies in tuber, root and sugar crops arise, among other things, from the fact that they yield food materials early during the luxuriant vegetative stages. Likewise, the relative inefficiencies of cereal and pulse crops may be attributed due to their yielding edible seeds, after flowering and fertilisation, in the ultimate metabolic stages of maturation and senescence of plants. The flowering and early stages of fruit and seed development would be more efficient than those of maturation and senescence, some evidence for which appears in the slight greater productivity of edible dry matter in green peas than that in dry ones (Table 2).

The second assumption is based on the totality of bio-production and its relation to the mode of holding and supporting the food materials and food bearing organs, and thereby the relative amounts of edible and non-edible matter. Table 3 gives the approximate values of proportions of edible matter in total bio-production of some crops. From this, an obvious advantage appears to be inherent in in the accumulation of reserve materials in underground organs which need no extra support for being held aloft. In contrast, the total production in plants with above-ground food bearing organs also involves providing for extra supporting material to check them from falling down; for example in mature plants of cereals or pulses, a certain minimum amount of stalky supporting (non-edible) material is necessary just to keep them standing. This is not necessary in tuber and root crops, and evidently only partly in case of groundnut crop. However, differences in efficiencies between similarly placed crops could arise from differences in the

TABLE 2

Average yields of food crops in the Netherlands

Average yields of some major food crops in the Netherlands (FAO Production Year Book, 1968) and the calculated yields of edible dry matter, calories and protein are given per hectare, along with the productivity per day.

Food crop (days on land)	Production Per Hectare				Productivity/Day/Hectare		
	Crop yield (kg)	Edible dry matter (kg)	Calories (1×10^6)	Protein (kg)	Edible dry matter (kg)	Calories (1×10^3)	Protein (kg)
Wheat (180)	4,790	4,200	16.3	575	23	90	3.2
Maize (180)	3,790	3,200	13.2	420	18	73	2.3
Peas, green (120)	10,600	2,970	9.9	760	25	82	6.3
Peas, dry (150)	4,180	3,500	13.5	780	23	90	5.2
Potato (180)	35,000	8,750	34.0	560	48	189	3.1
Sugarbeet (220)	50,800	8,130	31.4	—	37	143	—

the edible matter produced. The bio-processes in food plants have two major functions, one for production of the food materials, and the other for production of such material as necessary to hold and support the food material produced. Thus the production efficiency must depend upon the peculiar characteristics of the plant species which determine the nature of storage system for reserve materials, and nature of total tissues formed; for example, the underground potato tuber, whole of which is edible, represent a greater efficiency than the underground sugarbeet root in which a good amount of non-edible tissue has to be produced to hold the sugar solution.

The basic premise for the third assumption is presented in figure 2, as theoretical efficiencies calculated from biochemical pathways

of synthesis. With the total production efficiency inversely affected by the increasing complexity of compounds to be synthesised in the total process, it is suggested that, in terms

TABLE 3

Ratio of edible to total dry matter production in food crops

Data for total production are computed from combined yields of main harvest and forage, excluding the root system lost underground. Edible dry matter is presented as per cent (%) of the total dry matter produced.

Wheat	50	Groundnut	58
Rice	50	Soybean	50
Peas, dry	50	Potato	81
Peas, green	37	Sugarbeet	44
Rapeseed	30	Sugarcane	80

of food production, sugar is most efficient followed by starch, and the protein and fat least efficient. The efficiency of food crops

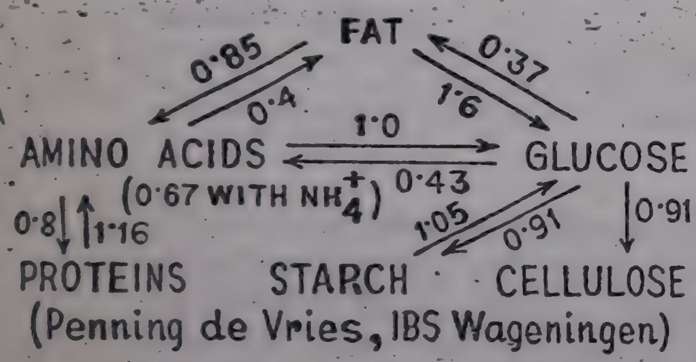

Fig. 2.

would, therefore, also depend on the nature of major constituents present in the edible material produced. The production of cane-sugar is invariably most efficient, that of beet-sugar being relatively inefficient because of reasons to be discussed in detail later. The potato is most efficient also because of high starch content, low protein and negligible fat. Even between rice and wheat, former is more efficient because of less protein. The lower efficiency for calories in green peas than that in dry peas, is evidently from a greater accumulation of fat in the latter, with the variations in fat levels in no way affecting the higher efficiency of former for both dry matter and protein because of practically similar biochemical synthetic efficiencies between fat and protein. In general, it may be stated that, beside sugar, the production efficiency of starchy foods of versatile nature would, in terms of edible matter, decrease progressively with increasing level of protein and/or fat in it.

Practical applications

Since a reference, in the preamble, was made to introduction of soybean and sugarbeet into India, it is apt, for the obvious reasons, to compare them with groundnut and sugarcane respectively, and to apply the proposed assumptions to these practical examples and verify their validity from available data. For a valid comparison of the productions efficiencies, the data for two compared crops need to be from one and same area. With no access to comparative data from different regions in India, and nor such data for either group of crops (soybean and groundnut, and sugarbeet and sugarcane) available for India in the FAO source book, the data in tables 4 and 5 are taken for countries which might cumulatively represent different parts of India, at least somewhat with respect to climate.

As is commonly known, the introduction of soybean into U.S.A. more than half a century back has given it a considerable advantage over groundnut in terms of inputs of research and development, and this advantage accompanies it during its extension into other areas. Inspite of this, the two obvious conclusions from the data in Table 4 are (1) that in all areas, groundnut with its greater than two-fold oil yield far outweighs soybean as an oil crop, and (2) that in Asia and Africa, particularly in the countries with feudal land relations and inadequate agricultural inputs, the differences in protein yields between the two crops are not great enough to enable the composite protein-cum-oil yields from soybean in any manner compensate for the losses in oil yields from displacement of groundnut. Beside this factual evidence, the proposed assumptions on factors determining the production efficiency, on application to the two crops, suggest the superiority of groundnut to be inherent in the production characteristics of the species

itself. Although the edible material in both, soybean and groundnut, is seed as a product

TABLE 4

Comparison between Soybean and Groundnut

Crop yields (FAO Production Year Book, 1968) and therefrom calculated yields for oil and protein are given in kg/hectare. Number of crop days on land, from sowing till harvest, being practically similar, yields are directly comparable.

Country	Soybean			Groundnut without Shell		
	Edible matter	Oil	Protein	Edible matter	Oil	Protein
U.S.A.	1,650	330	710	1,390	700	350
Japan	1,350	230	580	1,500	750	380
Indonesia	730	150	310	800	400	200
Thailand	910	180	390	910	455	230
Nigeria	890	180	380	860	430	220
South Africa	650	130	280	880	440	220
Uganda	590	120	250	560	280	140
India*	—	—	—	540	270	135
Columbia*	2,230**	450	910	—	—	—
Israel*	—	—	—	2,400**	1,200	600

* FAO data only for one crop; ** maximum national average in world.

of maturation following fertilisation and subsequent developments, the relevant distinguishing features are as follows. Physiologically, groundnut yields food material at an earlier stage when the plant is still photosynthetically active; in groundnut after pegging, no more bio-production is involved to provide for supporting stalky material to keep the food organs aloft, thereby increasing the proportion of edible matter in the total bio-production; and the variations in relative amounts of the two major constituents, protein and oil in the edible material of either crops, do not induce differences in the overall food production efficiencies because of more or less similar bio-synthetic efficiencies. In addition, the harvest of groundnut at an earlier physiologically active stage of plants also increases the availability of green haulms and vines, as more productive and nutritious material (than the dry stalks of soybean) for feed and also as valuable raw material for production of leaf protein. Thus groundnut seems to be in all respects more productive than soybean, and also a multi-purpose crop with further potentialities for improvements in production efficiencies from greater research inputs.

The data on sugar yields in Table 5 point invariably to greater productivity of sugarcane over sugarbeet. This could merely be attributed to greater solar energy available in tropics and subtropics where sugarcane is generally cultivated. However, even within the narrow regions of Iran and Pakistan, sugarcane is found to be more productive. When we apply the proposed assumptions on factors determining the production efficiencies, we find that in both crops a similar product

TABLE 5

Comparison between Sugarcane and Sugarbeet

Crop yields (FAO Production Year Book, 1968) and therefrom calculated sugar yields are given in kg/hectare, along with the productivity per day. Number of crop of days on land from sowing till harvest is given in paranthesis for sugarcane/sugarbeet.

Country	Sugarcane		Sugarbeet		Sugar Productivity
	Crop yield	Sugar yield	Crop yield	Sugar yield	Cane/Beet
U.S.A. (300/200)	67,800	13,600	38,400	6,150	45.4/30.8
Japan (300/220)	65,700	13,100	33,100	5,300	43.7/24.1
Spain (300/200)	69,900	14,000	26,500	4,250	46.7/21.3
Iran (300/160)	29,900	6,000	17,400	2,780	20.0/17.4
Pakistan (300/160)	39,300	7,850	14,000	2,240	26.2/14.0
India* (300)	47,600	9,520	—	—	31.7/ —
Hawaii* (500)	230,000	46,000**	—	—	92.0/ —
Netherlands* (220)	—	—	50,800	8,130**	— /37.0

* FAO data only for one crop; **maximum national average in world.

(sugar) is produced and accumulated in storage tissue of similar physiological stage (vegetative), but that, inspite of sugarbeet having underground storage organs, sugarcane has a greater proportion of edible matter in total bio-production (Table 3). In sugarbeet, there is an obvious involvement of an extra mechanism for translocation of total materials from the above-ground photosynthetic tissue to and for the underground storage tissue. Beside this, there is also difference in the nature of storage tissues. In sugarbeet roots, the thin-walled and almost spherical storage cells form part of a complex tissue system, wherein the storage parenchyma is interzonal between concentric rings of vascular tissue in several annular zones of growth, involving evidently production of large amount of non-edible cellular materials. In sugarcane stem in contrast, the thin-walled and cylindrical storage cells are relatively large in size and form the ground tissue of storage parenchyma, throughout which the fibro-vascular bundles are scattered. This peculiar nature of the storage tissue in sugarcane gives it also the ease with which the sugar solution can be separated by simple squeezing or simultaneous crushing and pressing. This is not possible in sugarbeet, where instead the sugar solution has to be separated from the pulped mass by straining through cloth or by centrifugation. Therefore, from the differences in the species' characteristics of bio-production itself, the sugarcane appears to be more efficient sugar crop than sugarbeet.

With this evidence in support of the proposed assumptions, one can venture in their further application for placing the food crops for different purposes in India in the following order of priority.

For sugar: Sugarcane/Sugarbeet.*

For food calories from versatile starchy materials: Potato/root crops (sweet potato, yam, tapioca)/Cereals (rice/wheat and millets).

For edible oil: groundnut/short-duration oilseeds/soybean.*

For food protein: legume-pulses and cereals/groundnut/short-duration oilseeds* and soybean*.

* Crops needing some sort of new and somewhat sophisticated technology.

A need for systematic investigations to verify the validity of the proposed assumptions is obvious. In applying these assumptions to develop a practical approach for increasing food production, certain important criteria need to be clear. The climate and soil environs of a region would necessarily condition the choice for the type of crops to be cultivated. A reemphasis appears to be necessary on the tremendous potentialities of plant species and strains, having evolved in one area as part of the natural process and sustained development in the past, because of the advantages of their already acquired natural hardiness and disease-resistance over those being newly introduced from other regions. The requirements of the region in terms of sugar, versatile starchy foods, edible oil and protein should essentially determine the nature of food crops to be incorporated in the plan of agricultural production. However, instead of an arbitrary selection of crops, an overall view of the total requirements, and the potentialities and implications of various programmes needs to be seriously taken into account. An important criterion of practical value is also to evolve crop cycles which keep the land under most efficient bio-production for the greatest period.

Conclusion

1. From the available data and analyses of plant characteristics, certain assumptions on factors determining the food production efficiencies in plants are put forth, based on the physiological stage, purpose and nature of production.

2. There is an obvious need for systematic investigations to verify the validity of the proposed assumptions, comparing the yields between the best varieties of different species cultivated under optimum conditions of recommended inputs.

3. Further multi-pronged research (agronomic, physiological and genetic) should aim at maximising the food production efficiencies in terms of the valid assumptions, along with developing suitable approaches and technologies for an optimally integrated use of the total bio-production of plants. In genetic

research, instead of attempts at increasing protein content with inherent adverse implications on total yields, the emphasis must be towards maximising the production and accumulation of the reserve food material.

4. Research and extension must aim at developing crop cycles for the maximum bio-production activities on land for the greatest period.

5. In the overall choice of food crops, it is essential to have an appropriately integrated perspective of the bio-production efficiencies, food requirements of the nationality as a whole, and the economic and political implications of various programmes.

Beside the sources of information listed below, the benefit of discussions with several scientists of Wageningen (Netherlands) is acknowledged, which provided useful data and helped in developing the theme.

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9

roblems of Young Scientists*

N. Singh, India

problems stated

PROBLEMS of young scientists, are generally concerned their economic, social and professional conditions, in that order. Since these problems in the present ext, arise from experience gained in a particular surding, some ideas about the situation in education, emnent opportunities and the environment in professional utions are relevant.

lucation. There has been a gradual expansion in Indian ation during the last two decades. The figures of *ment of students* in 1968–69 show a little over 10% e total population entering the primary classes (I–V), 5.5 million, about 3% of which at 1.69 million seeking ement at the University level and 40% of the latter g for science and technology courses (0.68 million). anticipated enrolment for 1973–74 for the science es is 1.19 million.

cause of the overall employment situation, a degree is dered to be essential for many jobs and in science or ology a priority, with the discipline for training being mined by totally subjective demands operating at the time. The general consensus is that the quality of tion has gone down because of a lack of facilities, ion and purposefulness. In technological training in ular, on one side of sophisticated technology with no nce to local problems is taught, and on the other cal training is nominal and has no relation with trial activity.

eeling of insecurity regarding possibilities of employafter education prompts corrupt practices to achieve s in examinations. In the absence of training prones linked up with planned man-power requirements, ratic turn-over leads to acute problems of unemployand mal- and under-employment. The educationsion and the consequent increase in the number of ates and technically qualified personnel goes on swelle number of job-seekers and of unemployed. Accordyouth and student leaders, the over-riding sense of rity is the main cause of mounting frustration among ucated youth.

employment situation. The estimates for the unemd in 1970 were a total over 3 million, of which, whiteeducated 200–900 000, technically qualified 0 000, and the specific figure for Electric Engineers ates and diploma holders) being 17 000. One in five engineers is reported to be unemployed.

mployment is invariably associated with mal- and employment. A limited survey of advertisements in tional dailies, made recently, revealed a trend of about 50% of vacancies with undisclosed salaries (subject to experience and open to negotiations), 8–10% with salaries of over 1 000 Rupees per month, 30–40% between 300–500, and rest below 300. It is found that even for the jobs below 300 Rupees per month, in most cases a degree in engineering/technology or a master's degree in science subjects was necessary. A further trend has been disclosed of better salaries in the industrial sector where no research and development work is done but which do draw away the scientific personnel from the educational and research centres.

The situation in scientific institutions. The vast majority of young scientific workers are in Government sponsored educations or research institutions. The feeling of insecurity continues from 'temporary' or contractual jobs, and from a lack of career and promotion opportunities. A good deal has already been said about such institutions being ridden with obsolete and redundant management and personnel policies and with stultifying environment. With the hierarchy and bureaucracy in operation and because of the traditional and immediate background influences, the young scientific worker often becomes a self-seeker. In the true spirit of widely prevalent economism, he aspires for greater economic and social benefits and, following in the footsteps of his seniors, he resorts to all possible means for promoting his self-interest. In the melee of rush for favours when he fails, as is inevitable since only a small minority can succeed, he becomes frustrated. Consequently, a feeling of apathy, cynicism and fatalism is found among young scientists.

Suggestions for improvements in conditions

From the discussions with scientists individually and from the deliberations of various conferences and meetings, including those of the *Association of Scientific Workers of India* and its affiliate bodies, suggestions emerged for improvements in the economic, social and professional conditions of scientific workers and can be summed up as follows:

(a) *Young scientific workers.* Beside the security of jobs, their demands revolve round personnel policies to secure better career and promotion opportunities. Because of education and training under trends and values, borrowed and transplanted from the rich countries, they put forth demands for freedom for work in areas, which they consider as 'frontiers of knowledge', and in fields of sophisticated technology mainly of interest to the richer countries, and for facilities for such work.

(b) *Senior scientists.* Reflecting of the social-democratic approach on the national scene, their suggestions cover a wide range. They include on one side, calls for application of project oriented research, for intermediate or appropriate technology, for guided import

s article, [redacted] not reflecting any official view point, has d from discussions among some scientific workers at (India). The responsibility of presentation is, however, f Narendra Singh currently working at I.B.V.L., Wagenn leave from C.F.T.R.I., Mysore. This paper opened the on on the situation of young scientists in developing

of sophisticated technology and for self-reliance; and on the other, demands for more power and incentives to local managements, for greater autonomy, for more freedom in research pursuits and in mobility, for relaxation in administrative procedures and central bureaucratic controls; along with the usual demands for bigger budget for science and technology and for better salaries and allowances to put them at par with the new affluent technical elite in the state or private monopoly collaborations.

Some of them say that the deterioration in the quality of Indian science (implying that it was somewhat better and more useful in the past) due to emergence of what they call a new "science bougeoisie", which is inordinately preoccupied with organization and management of science. While some others believe that the hold and patronage of the obscurantist scientist elite (who take modern science as an exotic phenomenon) is pernicious to the Indian science. Besides, attention has been again and again focussed on a lack of social and political support in the absence of science and technology being recognized as essential factors in development.

Reappraisal of the problems and their context

The national leaders seemed to have recognized the importance of science and technology as is indicated by the expansion and proliferation of science teaching and research institutions and technological training facilities under various organizations; the personal association and patronage of the late Prime Minister Nehru (and currently of Prime Minister Indira Gandhi) to even organizations like ASWI; the adoption of the Science Policy Resolution in 1958, acclaimed by all around the world as a very progressive step, and successive conferences to review its implementation with the latest having been held in November 1970; frequent debates and statements showing concern and suggesting measures for improvement. Thus, the Government has been making efforts, national leaders have been expressing their concern, and the scientists have been putting forward suggestions for improving the conditions. But the conditions have continued deteriorating with the frustration mounting among the young and senior scientists alike. The questions naturally arise — Why have frustrating conditions in education and science been allowed to develop? Why have social, economic and professional conditions of scientific workers continued non-conductive to growth and promotion of science and technology? And this inspite of all these efforts in the past. If it was a question of finances, why have adequate funds not been forthcoming to build up education, science and technology as assets to development?

In referring to a lack of political support, a brief mention of the fundamental issue has been made in one of the papers at this symposium. But there is a need to go deeper into this. Whose political support? Not merely that of the social-democratic leadership in the Government, adopting a patronizing attitude to science because of the prestige value, but a real support of those interests who in reality direct the socio-economic scene. If frustrating conditions in science had created obstructions in the socio-economic trends, unfavourable to the ruling interests, there would have been a tremendous political pressure for a change. In its absence, what is the need for a change? None, whatsoever.

Most of us in the Indian scientific workers' movement have drawn tremendous inspiration from the classical treatise of Bernal — "The Social Function of Science", published in 1939. Reflecting the crises in the U K in the late twenties and early thirties, several socially conscious British scientists expressed their feelings in a remarkable collection of esays entitled "Frustration of Science", published in 1935. In it, both Bernal and Blackett raise the very pertinent-questions of "whose interests does science serve". And this is the major question before us in India. (Lord Blackett apears to have forgotten his own analysis of that British period, in his present role of advising and sermonizing the Indian leadership on the organization of science and technology).

Against elitism

For a positive approach in efforts to tackling the problems of young scientists, nay the people as a whole in India, *we must give up* our concern with the problems of building up *science establishments* in a developing society, to create "towers of science" and confine researches within their walls, to work for personal fame and/or gain through "paper-research-paper" or through selling our services to the highest bidder, and to indulge in slogans of and in debates on advanced and/or intermediate/appropriate technology, judiciously imported and/or self-reliant technology, and this or that education system.

We must, instead, start looking at the problems of making science serve the goals of economic development and analysing the real obstacles in objective conditions for effective growth and promotion of science and technology, to overcome inhibitions of stereo-types and transplanted attitudes of copying foreign models and measuring our work against advanced international standards, to avoid wastage on esoteric research, to avoid wastage of resources in developing over-sophisticted technology when simple and less sophisticated technology meets the needs, and to strive for really self-reliant technology by developing through indigenous research and effort capable of producing all modern technology needed for economic development.

Integral to the above is an understanding of the dominant socio-economic forces on the Indian scene, whose interests are either served or not obstructed by the continuing frustrating conditions in education and science. In addition, since the total approach and activity of individuals is bound to be influenced, consciously or unconsciously, by a certain philosophical thinking, whatever their subjective wish may be, some knowledge is necessary also of the socio-economic and cultural background of the people privileged to be scientists. It is in that direction that an attempt is made in the following to analyse the socio-economic and political context of the Indian scene as it affects science, and to analyse the heritage of scientists to expose the influences alienating them from the mass of Indian people as a whole.

Socio-economic and political context of Indian situation in relation to science

First a glance at the general scene — more than 80% of the Indian people still live in villages, less than 10% of which had acquired some electric power by 1969; the general literacy is around 30% level; income-tax payers, that is people with a monthly income of around Rs. 400, constitute only about 1% of the total income earners, and the gap between the rich and poor even among the income-tax payers has increased much wider than most other countries according to recent statistics. A recent survey under the UN Economic and Social Council has drawn attention to the very wide disparity between the rich and poor as a consequence of policies and programmes in the past.

In the agricultural sector, repeated slogans for radical land reforms expose the continuing hold of the feudal landlords over the vast rural masses of poor peasants and landless workers. With incentives to technology-biased agriculture under various programmes in the richer tracts of the country, the seeds are being sown for an increasingly wider disparity in the rural areas. In the urban areas and industrial belts, the economic disparity is widest. The monopolistic and comprador trends in the industrial sector

: become most exaggerated. The main features in in-ry, both for capital and for consumer goods, are ırds acquiring modern and sophisticated technology :r foreign investments, foreign collaborations or foreign ıdiaries. The infrastructure of small scale industries s shape mainly to play an ancillary role to the needs ıodern and sophisticated industries. The developmental grammes, which cater to demands of a market-biased ety, find extensive and intensive support of diverse 'aid-grammes'. Since the widening economic disparity and purchasing capacity of the vast majority of people is rent with the limited potentialities of the market within a, an emphasis is naturally directed towards export notion in the name of exchange earnings.

nomic domination

vould be apt to describe the present Indian situation as comparable with the Chinese situation about half a ury back — strictly not colonial, because of official tical independence, but the socio-economic foundations weak to prevent the combined pressures of outside ıomic forces and powerful local interests from correctly ping the national economic and social policies. In other ds, the situation of a semi-feudal and semi-colonial ety prevails in a world of neo-colonial trends.

he total effect of such a situation on science and tech-ogy is bound to be subordination to the interests of ıopoly and comprador sections subserving the foreign ed interests. However, almost all R and D activity in ia is located in the Government sponsored research blishments (industry contributing only 6% of total R D allocation in 1969—70), and most of the industrial duction is under some sort of foreign collaboration. ording to some experts, 90% of our industrial produc-ı is based on foreign collaborations without any active : for indigenous design organization. Not even the e controlled enterprises, themselves operating with ign collaboration, have either their own units for signi-nt R and D activity or any statutory links with the e-sponsored R and D centres. The latter claim to be aged in developing indigenous technology in specialized ds for self-reliant industrial and economic development. slogans and resolutions for industry's dependence for technological problems, its further development and dernization on the indigenous R and D establishments, e recurringly ended in mutual recriminations among the ustrialists, R and D experts and the Government cials.

Why should the foreign vested interests, dominant on the ustrial and economic scene, support and encourage an igenous R and D activity, which would reduce their antages due to the existing technology gap in the world? d the local feudal and comprador bourgeoisie interests e neither the urge nor capabilities for making demands and for an indigenous, self-reliant science and tech-ogy. Under these circumstances, the interests of the ninant socio-economic forces and their allies, instead of ng obstructed, are served by inaction under frustrating ditions and by diversion of the youth and scientists into blems of subjective nature. Therefore, the base for nce and technology being recognized as essential factors levelopment is absent, and the social and political forces missing which could and would demand for and pro-e effective support to indigenous science and technology a rapid and self-reliant industrial and economic devel-nent.

or eliminating the basic causes of frustration of youth scientists, the major issue before us is to determine and st the social forces which would stand against and uproot strangle-hold of the local feudal groups and the comprador bourgeoisie sections, subserving the domineering foreign vested interests. When such social forces come into power, and only then, objective conditions would be created for promotion of education, science and technology in the interest of the people as a whole.

Socio-cultural heritage of educated youth and scientists

The economic and social stratification of a long established and deeply entrenched feudal system has led to the privileges of education remaining a practical monopoly of certain sections of the society, not directly engaged in production activities. The benefits of education-expansion, first during the colonial period and then after achieving political independence, have also largely gone to these sections in increasing numbers. These sections of the population, roughly in the order of privileges in the past, comprise mainly of civil and military officials, teachers and priests, businessmen and traders, money-lenders, landlords and rich peasants, etc. etc. The philosophy of social stratification, long acepted as norms among the feudal sections, has given rise to characteristic socio-phychological attitudes, some of which most overtly reflected are callousness to surrounding poverty, entrenched caste and class barriers, aversion to manual labour, formal respect to status and age, intellectual servility to 'superior' ideologies but acquiring them merely as transplantations, etc. This is and continues to be the background heritage of the educated youth and scientists, inherently alienating them from the socio-economic needs and urges of the vast humanity of the poor and labouring masses around. The evident result of this is their continuing concern (consciously or unconsciously) essentially with problems of self-interest, totally divorced from the interest of the society as a whole.

Beyond this alienation caused by social stratification, probably typical of old feudal societies, further complications in India have arisen from an education through an alien language and for an alien purpose. During the colonial rule of the British, there was a significant expansion in education to create native cadre for assistance in local administration and this education necessarily was through letters of the rulers with an altogether alien social and cultural background. A further support to education in English and on the style of English schools came from the social reformers and other leaders, indoctrinated with modern ideas but themselves belonging to an alienated elite in the vast Indian communities. The legacy of language, education and thoughts has continued after the termination of direct colonial rule, with the seats for intellectual inspiration also continuing to be located in the developed parts of the world. A shift is of course evident with the British losing its supremacy and the glitter of the affluent technoligical United States dominantly enchanting, interspersed with socialist professions of faith in varying forms.

To say the above is not to belittle the positive influences of the new education, thoughts and trends, but the reality should be known. We have an educated youth and scientific community, as part of the intellectual and political elite, which feels proud of speaking a language not intelligible to the vast majority of the people around and which professes modes and thoughts, totally transplanted and, therefore, not making any essential impact in their practical life and leading to an overt dichotomy in their behaviour.

In summary, the educated youth and scientist in India is, in general, a product of complex socio-cultural past and present, which alienate him from the vast Indian masses around him. Unless he undertakes a serious self-criticism of his background and attitudes and, as a result, adopts correct lines of action, it does not appear possible for him to play an active role in assisting the social processes which would really give rise to objective conditions for his better future as part of the total society.

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PROBLEMS OF YOUNG SCIENTISTS

A symposium on "Young Scientists and Contemporary Society" was held at Enschede, Holland (14-16 July 1971), sponsored by the World Federation of Scientific Workers and hosted by its affiliate Dutch organization of scientific workers (VWO). Most of the participants were from Europe (both West and East), the U.S.S.R., Japan and U.S.A., with some from Algeria, Cuba, India, Libya, Syria and the U.A.R. The formal sessions on the first two days were devoted to the presentation of the problems. After some discussions on the general outlines of the problems in the three broad areas of the world (countries with developed capitalist or socialist economy and those of the third world, commonly known as 'underdeveloped' or 'developing'), as presented by the panel speakers, attention was focussed on the social and economic problems of young scientists in university research institutes and industry. and of those in post-graduate education and training. The third day was devoted to 'setting goals for science and technology: role and responsibility of young scientists in contemporary society', and to discussion of 'initiatives and activities to concretise the social responsibilities of young scientists; plans for future activities'.

The trend of discussions during the earlier sessions apparently did not come up to the expectations of several young participants. This led to their informal deliberations, very interesting indeed, on the second evening till late hours, and on the third day they came up with an improptu statement of some points of common concern for discussion. They were given an opportunity of an informal session before the closure.

The following appeared to be the general nature of problems in different areas, as enunciated by the panel speakers and other participants.

Situation in capitalist economy countries

According to the panel speaker (A. Jaegle, France), in the view of the two trade unions in France and U.K., the young scientist in the West has to face not only the problem of a positive use of his education and training (continuing from the past), but also, now, the problems of under- and mal-employment (from post-war developments of expanding use of science in industry and the accompanying urge of the employers to take on graduates and put them on lower tasks not needing their qualifications and training), of unemployment (from current economic crises and dismissal of experts with specialised training), and of unsatisfactory employment (although in jobs suited to qualifications and training, but in areas under demand from and for benefit of the financing concerns, in military research or in profit-motivated areas of anti-social values). The compulsions to accept employment, they do not approve of, lead the youth to a sense of frustration and resentment against the society. This situation is making even the trade unions raise the questions of the capacity of the economic system itself. The problem of disparity in remuneration with skilled manual worker is inducing an awareness among the young scientists for trade union and collective action for salary and other employment benefits, for incentives in work and for freedom for publishing the results of their work. The trade unions feel confident that successful achievements on these issues through collective action would produce an aspiration in their members for a change in society towards a better role and use of science and scientists.

In the subsequent discussions and problem-presentations by different country speakers, along with the general problems of drop-outs the following issues emerged. Education in the Netherlands (and in other capitalist countries) has acquired merely an economic role. Professionalism has emerged as the greatest danger to science and education in U.S.A. In a specific reference, mal-employment was reported to be a growing problem in West Germany (F.G.R.) from academic over-production, both qualitative and quantitative. Beside the problems in common

with other countries of West Europe, the special Belgian features affecting science, education and scientific community in that country consisted of the language controversy (Flemish *vs* French), rigid finance-holding structure of the local economy, and the European Common Market (E.C.M.). This situation in Belgium on one side diverted the political movements into subjective partisan directions away from the basic issues of the socio-economic system and its underlying ideology, and on the other induced the scientists to struggle for hierarchial possibilities in the local finance-holdings (in personal ambitions for future) and in the carefully designed machinery of E.C.M. (in new urges to become technocrats). The problems of Japan, an Asian capitalist country, as in increasing mal-employment and unemployment were presented as those arising from neglect of education, unplanned university expansion (for profits, social estimation and out of growing industry-university complexes), and the growing economic stagnation and depression (from growth of monopoly capitalism and militarism out of intensive Japanese U.S. collaborationist expansion).

The problems of women scientists were referred to with a particular reference to their progressively decreasing proportion in higher education and in higher jobs in U.S.A. Some reference was also made to the cultural alienation of scientists from the common people due to the specialised training. A specific reference was to all these problems in the capitalist countries arising as part of the world wide crises around the issues of arms and weapons, population, pollution, resource usage, and also poverty and starvation.

There was a general recognition of the acuteness of the economic and psychological problems of the scientists in the capitalist countries, both in areas of planned approach (an obvious reference to France) and in those with no planning, as in general. To some participants, particularly the senior scientists and articulate sociologists, the problems appeared to be of recent origin and they believed that their solutions were possible by movements towards education on social responsibilities and broader participation in decision making machineries. However, the vast majority was of the view that there was need for a social change. With respect to the mode of change there were two streams. One section, particularly the trade unionists, appeared to be satisfied with the pace in that there was a growing awareness among the scientists for trade union activity, for joining forces with the working class organizations, and for a critical reflection on the society geared to a totally economic point of view. Others, mostly young participants, were not satisfied with this and they were impatient for a radical change in the society. Although some among the latter talked of the problems, attitudes and thoughts as products of capitalism and old culture systems, the confusion persisted in calls for radical change (not clear from what, to what and how) to be carried out by young scientists (in utter ignorance of the context of their socio-economic and cultural background and the basic philosophy therefrom). In recurring emphases for the young scientists in developed countries to undertake solving the problems of the third world, there appeared to be zealous diversions to as if their problems arose merely from underdevelopment of that part of the world. In general, the senior scientists and trade unionists appeared to be annoyed on the impatience of and criticism by the youth.

The significance of the reports from Japan were missed, because of language difficulty and also probably because of other obsessions. An attention needs to be focussed on the positive features of their movement, in which joint struggles of scientists, teachers and students are taking place for democratic rights, raising the issues of Jap-US collaboration and the resultant monopolist and militarist adventures as the origin of their problems. The Japanese speakers recognised the shortcomings in the attitudes of scientists, describing them as 'octopus in pot' (not wanting to know the real situation, not minding direction by others, not trying to know their real role), which evidently reflected the truth of the situation everywhere in the world.

Situation in socialist economy countries

The Panel speaker (G. G. Kotovsky, USSR) asserted that the appreciation of the need of the scientists' work for society, the high social status of the scientist and complete absence of the phenomenon of "educated unemployed" were the most important things determining the social microclimate in the socialist economy countries. In the absence of conflict between society and science, therefore, the special questions concerning the relations between young scientists and society embodied in the state did not exist there, as in capitalist countries. However, in the evolved organisational forms of scientific research, certain structural disadvantages do arise (gap between the leading scientists and mass of students and junior scientists, delay in application of results of research, and heterogeneous and cumbersome relation between the scientific organizations and the economic and executive bodies). This has already induced a process of broad reforms in higher education and science aimed at their integration with industry (particular reference to G.D.R.). The young scientists have now a sharper perception of all problems involving science and public life. The social responsibility in them is nurtured by ideological education, by consistent efforts in drawing into higher education people from various social strata (above all from worker and peasant background), through various social links, and through equality of salaries between most scientists and skilled workers. In this way, an important socio-psychological effect is achieved in making "elitism" uncommon among scientists and the ideas of "technocrats" fail to muster substantial following among them. Alongside measures of public influence, a system of public control also operates over the performance of individual scientists and organizations (periodic recertification and competition to fill vacancies, and public accounting of funds etc. etc.). Problems, however, still arise from personal factors of liberalism in overlooking individual weaknesses (causing presence of inadequately qualified personnel) and of narrow-minded approaches (evident sometimes in poorly conceived recommendations harming the biological environment).

Dwelling upon the so-called "natural selection" of the most gifted into the scientific structures (selection from among under-graduates by competition, and training in science first for the Candidate and then specialised one for the Doctorate degree), it was stated that the system has largely proved to be satisfactory in the Soviet Union, but certain problems of promotion and career making have continued to exist. A criticism has been made of the direct dependence of the salary scales on academic degrees, of wasteful efforts in dissertations not always justified by the interests of science, and the difficulties of promotion-incentives and assessment, more particularly in technology where most works are of collective nature.

A satisfaction with the system of personal estimation of young specialists and of their participation in Academy decisions in Bulgaria was reported, as also the absence of generation gap in GDR because of active involvement of older scientists in the youth movements and in education reforms. The problems could be somewhat serious even in the socialist economy countries, came to be first reflected in situations in Hungary and Poland. Problems from saturation in some areas and fluctuations in general leading to mis-employment (not unemployment), after university education, were reported from Hungary. A reference to problems in Poland was made as in those arising from too long a time spent in education to awards of degrees, from conflicts of uneven development between agriculture (private) and industry (public) and the consequent economic and social issues, from the conflicts of modern life (pollution, noise etc.), and from serious questions of working class education (motivation etc.). On women scientists, it was reported that the young mothers did have problems in USSR, and that the problems in GDR were of a similar nature, but not of that magnitude, as those in U.S.A. In Cuba, the existence of a cultural gap between the scientist and labourer was presented as the major problem.

The consensus of speakers from the socialist economy countries was that the problems, as existing and arising in capitalist countries, were altogether absent in theirs because of fundamental differences in the economic systems and in social approaches, that the problems if any were purely non-antagonistic in character and arose from a backlog of situations, and that there existed in their system a self-correcting mechanism to solve these problems. To the other participants, the reports on situations in the socialist economy countries appeared to be too rosy and playing down the reality, leaving many questions unanswered. With reference to the historic task of the socialist societies, singularly presented in the meeting as that 'in international economic competition by means of speedy increase in the productivity of labour', the questions of the conflict between superstructure and base and of human alienation remained untouched, and in the deliberations they did not appear as creating problems in the socialist world (as if being solved by the magic wand of economic development), nor any indications given about the positive steps in attempts to overcome the lingering obstacles from the superstructure, if any. Further, the implications of the individual spirit of competition (as nurtured through competitive selections and promotion, and as apparent in evidence of dissatisfaction from lack of incentives in collective team work) were not, during the discussions, considered to be serious either for the present or for future social development.

The most populous socialist country, China, was conspicuous not only by its physical absence, but also by no reference to it during the discussions, none what so ever. Only in his introductory words, the third world Panel speaker lamented the fact of the symposium participants missing the opportunity of learning from the socialist experiences of China and from the interesting, educative and inspiring experiences of their historic Cultural Revolution.

Situation in the Third World

The panel speaker (N. Singh, India) declaimed his exposition from representing the situations in all countries of the third world, with the analogy possible to only those countries in which a socio-economic, political and cultural background exists, comparable with that in India (a majority of population agriculture-based in a feudal system and the overall economy subserving the foreign interests through the local feudal and comprador bourgeoisie forces). In India, because of the prevailing situation of insecurity from unemployment, and mal- and under-employment, and from a lack of career and promotion opportunities, there is a wide-spread frustrated feeling of apathy, cynicism and fatalism among the young scientists as part of the social fabric. For improvements in situation, the usual demands from the junior scientific workers are for greater security, and better career and promotion opportunities, and for 'freedom' in academic work; while the senior scientists call for organizational and institutional reforms, more budget for science, and higher salaries for scientists. Such demands have generally remained futile, because of ignoring the basic questions of the purpose of science in developing world and of the character of socio-economic and political leadership dominating the Indian scene and determining the policies in reality. Instead of a futile concern with building up science establishments, an emphasis is necessary on problems of making science serve the people and their needs. In a general analysis, attention was drawn to the weakness of the socio-economic foundations in being able to prevent the combined pressures of outside economic forces and powerful local interests, and to the alienating socio-economic and cultural heritage of the scientific community continuing as a serious socio-psychological obstacle in objective orientation to correct demands and actions. For removing the basic causes of frustration of youth and scientists, as part of the society as a whole, the points made out as urgent tasks before the scientific workers were—identifying and assisting the forces which could capture power and eliminate the strangle-hold of feudal groups and the comprador bourgeoisis (subserving the foreign vested interests); and for a really active and

positive move in this direction, side by side, sincere and conscious efforts for freedom from self-alienation, result of heritage and the continuing class and caste structure of the society.

The other participants from India considered the diversion of funds to armament and defence expenditure as drawback affecting the scientific activity and scientists, and the conflict between administrators and scientists serious, instead of any generation gap. The concept of a model university in the third world was presented in the details of the Assiut University (U.A.R.). But it became clear during the discussions that this University has so far failed to make any dent in the brain drain to the metropolis within or to the developed countries without. From various presentations from India, Syria and U.A.R., there appeared to be a similarity in appraisal and approach between the senior scientists in that the problems arose mainly from an inadequate recognition of the importance of science and technology, and that substantial benefit would accrue from international cooperation and selfless assistance by the developed countries.

The Algerian participant drew attention to, in common with the general problems, the special ones of his country, what he called a very young one in terms of liberation and in terms of development of native organisations of science and scientists. These problems consisted of existence of universities not based on local realities (purpose, language, human and cultural environment alienating the youth from the common people; education and research activity still linked to former colonial approaches in programmes and thought-trends; economic poverty of young cadres in teaching posts; and foreign scientists, settlers or sent as experts, continuing developing strongholds of the outside vested interests), difficulties in structural changes in universities (traditional modes of teaching and research and administration and organization, and in adoption of national language), material and socio-psychological difficulties (isolation, absent or precarious scientific activity, paucity of journals and meetings, strict control over basic research leading to slow provisions, and the unavoidable psychological consequences from disparity in material conditions between the young native scientists and foreigners doing similar jobs within the country). Here also suggestions were made for selfless international cooperation, exchange and assistance from the developed countries.

The size and nature of representation from the III World (mainly scientific elite) did not make possible any serious discussion on the basic socio-economic, political and cultural issues involved in sustenance of the underdevelopment. Certain subjective issues, presented as major problems, were caught upon as planks probably in soul-saving urges in talking for actions and programmes to solve the problems.

Responsibilities and tasks

In socialist countries, the major issues were posed as those concerned with "international cooperation for peace, and cultivation of understanding of responsibilities towards humanity and of potentialities to influence the social and political developments all over the world". Exchange of scientists and participation in conferences continued to be emphasized. Pointing to the expensive nature of cultivation of education, science and scientists and with strong pleas for more exchange of information on edication and science, the themes were elaborated seeking for some sorts of international cooperation and international research, based on selective development, aiming at possible rational economy and expansion of effectiveness of education. Despite the differences in economic structures, no contradictions or obstacles therefrom were apparently visualised in such cooperative ventures.

From the Third World, a major emphasis was on building up and strengthening the scientific community and organizations to strive for more funds for education and research, for better salaries and for greater freedom in work and mobility, scarcely touching upon the basic issues of the purpose and of

the forces determining the trends. The scientists in the developed countries, WFSW and other international agencies were called upon for assistance (financial and cadre) in strengthening the scientific community and to study the problems of the Third World, to provide for more opportunities for training locally and abroad, and for participation in international meetings, to initiate so-called selfless collaboration programmes of international summer schools and guide centres etc. etc.

The participants from the capitalist countries, in their concern for the present and future as well, went at great length into different facets. The background problems reemphasized by them consisted of, as summarized here, dangers of world war (nuclear, biological, chemical), unplanned use and growth of science and technology (refliected in pollution, environmental destruction, ecological meddling, resource depletion etc.), social strife (from population growth, crowding, poverty, food shortage, controversies between rich and poor parts of the world), potential dangers of new and future technology (in computerization, automation, unknown developments), and the overall psychological effects (drop outs, drug addiction, crimes etc.). Some even referred to human alienation and its exaggeration from the technological mass production, automation and super-market oriented consumer society. In the context of special training of scientists, they were asked to realize and share the great responsibility. Some played upon individual action, but the general consensus was for collective action, in alliance particularly with working class. Some themes also contained references to the super-structure aspect of science and need for a change in the socio-economic structure and decisions making authority. In the wide spectrum of cross currents, one could grasp probably two common themes on responsibilities in operation—one, a need for discussions of the problems and questions in the widest possible sections of scientific workers (research workers, students, technicians, science teachers) ; and the other, an obsessive concern with taking upon themselves solving the problems of the hungry and poor of the third world (some even appeared to be engaged in projects beneficial only to that world).

The Japanese were again more to the point. According to them, the unity with the postgraduate students and their enthusiasm has acquired an important place in their movement, where the demands for better working and living conditions are considered basic to develop struggles against reactionary organizations of education and for democratization of research institutions, to eventually develop into all peoples' struggles. They identified the aims of their struggle simultaneously against the growing hold of the trinity of Industry-Military-Science on the society and increasing state control (monopolist and collaborationist) over the universities, and in support of democratisation of science for people's welfare, for developing peace and to present working in the interest of few. They defined the fight for democratic science as that for independent and creative acitivity, for opening of science to public and dissemination of research achievements among them, democratizing the organizations to make science an achievement of and for the people, and for guaranteeing the accomplishment of democratic centralism in research. As self-criticism and inner struggle, they called for fight to overcome the egoistic trends, to organise into mass movements, to overcome the tendency of political over-estimation of science and the policy of research for research and to take the people into confidence regarding the problems and principles of scientific movement.

On the concrete forms of tasks in general, suggestions contained local and international actions, some of which are summarized here. One forceful theme advised action on *local level* to focus interest of the local scientific community through seminars and conferences on the problems, and to organize interdisciplinary symposia to break the sectionalism and evolve integrated picture and solutions; action on *national level* to form joint organism of scientists and government to plan and regulate reorientation of scientific and technological enterprise; and action on *international level* to plan meetings, not for mere discussions,

but also for coping with the application of international policies in solutions of problems.

Two of the suggestions revolved round university structures. One called for formation of Centres for Man and Technology (World University for humanistic technology), involving transdisciplinary education and research, to study socio-technological paradox and for research on the level of ideas, principles, mechanisms and methodologies, and to become forum of public interest. The other proposed formation of international universities for imparting integrated education, balancing the four functions of science, defined as pure, service, critical and leadership. For really effective and successful functioning, such universities were visualized to be free from control of governments and of the surrounding society financing them. It was argued that this could be the most efficient form of international aid for the Third World countries, and also forum for solving the international problems and conflicts, by consultations growing out of the existing academic contexts and based upon mutual confidence that characterises "non-political, scholarly, scientific and academic" cooperation.

The role of WFSW in developing international contacts, exchanges and collaboration was reemphasized. It was suggested that the Federation should have a Youth Section, to specially deal with problems in this area, and that it should assist the scientific community and organizations in the developing countries. A specific point was made for the Federation to give up its European image and become a world organisation, particularly in the interest of Africa, Asia and Latin America. Towards this, the suggestions were for more meetings and conferences outside Europe.

An Overview

As an overview of the Enschede meetings, the following comments are made as thoughts aloud, raising issues for objective deliberations, if possible.

At the outset, the unwieldiness and unfruitfulness are apparent in discussing in one meeting the problems of different social enonomies and of different and distant countries. Now, with respect to problems of young scientists and youth (or any other specific problems relative to social systems), there could be one meeting for the capitalist countries, another for the socialist society countries, and several for the different regions of the Third World, and in each case there could be mere observers from the other parts.

At the meetings, there were sincere but futile attempts to indicate that the problems arose from inside the operating socio-economic system and because of the purpose which education and science was (or not) to serve. The usual diversions were, on one side, in calling upon the scientist to be the leader, deliverer and saviour, as if he could be altogether free from his background; on the other, there appeared to be an obsession, particularly among those from the developed countries, in taking upon themselves the tasks of solving the problems of underdeveloped world. Doubts need to be raised about these diversions.

Suggestions have been made about special funds and finances for assisting the scientists in the Third World countries. Cautions might be necessary regarding the implications of such approaches. With reference to recent discussions at WFSW, Pugwash etc. in this direction, it might be necessary to go at great length into this question, if the pitfalls are to be avoided. The suggestions for self-less collaborations or for international centres led by non-political, socially conscious individuals also fall under similar cautions.

Narendra Singh

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t Japanese now are indifferent situation that is arising from panese effort in several areas. our people lost a very good to think over what it is to be erialistic nation. That was the the last war. I checked the magazine *Sekai* in the period five years from 1945-1949 and only *one* article in that period with our colonial rule. In ticle there was not a word of —instead it wrote that it was stic and romantic to wish to Koreans equally with the se! The only article in five

people lost a precious chance was allowed us by the victims, the Korean people. We committed the crimes and then we forgot and now we are committing the crimes again. It is a very difficult situation.

Every war has begun in the name of peace. Even at the start of the Pacific war the Japanese Emperor said that this war was for the purpose of achieving eternal peace in East Asia. Prime Minister Sato is telling us that we have a peace constitution, that we are not a militaristic nation, that we are making our way to a peace State. Saying so he might send troops to South-East Asia. If we cannot check him we will in the near future see killing in the name of the peace constitution.

ustrialisation Without Indigenous R & D ?

NARENDRA SINGH

RING the last six months in India, after the March elections, e witnessed exaggeration of a of development with very consequences for the indige- & D. After a long stagnation, gns reappeared in April in the reporting that the political and climate of the country ssured the foreign vested in- hat India is safe for invest- nd for profitable exploitation manpower and natural re- in collaboration with the local

economic mission of the monopoly, Mitsubishi, found untry's stability, burgeoning and the tremendous potentia- r new investments with the government and industrialists or and inviting collaboration, factors for shifting its) accent towards India *nic Times*, 22 April). The ministration found the whole in turmoil except for which stood out as an f stability, indicating the serious Indo-American dis- on the emerging role of India in the region and for the further strengthening of deep economic and political relations between the two countries (*Indian Express*, 23 April). The Chairman of the Indian Investment Centre and the ICICI, Mr G. L. Mehta, stated that India's political stability, confirmed after the last general elections, had favourably influenced the British investors for opportunities in India; the British government has been considering special measures to encourage British firms to seek out more opportunities for investment in poorer countries (*Indian Express*, 29 April).

There has been reaffirmation of assistance to India in various ways from various quarters, both from the capitalist and Soviet bloc countries. The latest in the process are reported offers from the industrially advanced countries (West Germany, U.K. and Japan, mentioned by name) to shift large industrial plants and set them up in India in collaboration with the local entrepreneurs; the Government is understood to have expressed its willingness to offer prompt facilities for these industries which are labour intensive and whose operations in home countries are becoming very expensive from increasing labour costs; the plants proposed to be set up are of course second hand, but even so they are very modern compared to those already existing in India: the emphasis will be on exporting the products manufactured at these "transferred" plants to the donor countries (*Statesman Weekly*, 25 September).

The latest ventures could be part of a process on behalf of the world monopolies, cartels and corporations (private or social and State), in connivance and collaboration with the new elite of bureaucrats, entrepreneurs and professionals (see UNESC, CSD report on Social Development in Asia, March 1971), for converting the masses of India into a cheap labour force for agricultural and also for industrial production. To smother the possibilities of instability, unrest and revolt from sheer hunger and misery, while letting the local forces act as the main instruments of repression and oppression, efforts to maintain this labour force in a minimum state of physical fitness and comfort for the purpose itself would form a necessary part of the whole process...and towards that, also continuing doles to avert disasters from famines and other causes. Could one draw an analogy with the slaves of ancient Greeks who used the then technology for the elites but were themselves deprived of freedom of innovation and progress? The present process is aimed at converting the vast masses of the underdeveloped world into a labour force, agricultural and industrial, to serve the affluent areas of the world and the local elite. Whether the inherent contradictions would permit a smooth operation of this process is another matter.

However, these developments should give rise to a serious concern in the scientific community in general and particularly in CSIR and other establishments devoted to indigenous R & D for self-reliant industrial and economic development. In campaigns for improvements in economic,

al and professional conditions, e has been a growing recognition d a sober one indeed) among of the futility, without positive ctional changes in the objectivity purpose, of the indigenous R & D. ong the hordes of obstructive fac- from the prevalent socio-economic political situation, attention has repeatedly drawn in recent times he continuing obstacles from ex- ling foreign subsidiaries, invest- ts and technical collaboration. The sfer of whole industrial plants, as of investment and collaboration ew plans and policies of the world local social-economic and politi- forces, would further reduce the for indigenous R & D and, the- e, any need for positive changes nducive economic, social and pro- onal environment for the scien- community.

is may be industrialisation with- ndigenous R & D, but for whom at what costs to the common le, including the scientific work- nd their future? High time the tific community woke up and cipated in the struggle for its nt and future.

ilms From Japan

By A Film Critic

E excellence of the Japanese cinema has long ceased to be a ing point. Within the limited tunities had occasion to Japanese films from time time. Kurosawa or Mizo- , or Ozu or Ichikawa are no obs- names in books and journals. ave seen samples of their work. ave seen bad films too. The films being shown by the film ies in Calcutta now do not of any well recognised name. ver, two of them should easily nce anyone of the power and y of the two directors.

Kozaburo alias Kimisaburo Yoshimura has often been compared to Mizoguchi for the sensitive portraits of women he draws in his films. He has also been described as a versatile director, i.e. one who can create any kind of film, tackle any kind of subject. In that way he is supposed to be unique in Japan. Since this is our first introduction to Yoshimura we cannot speak of those qualities as being self-evident. There is no doubt however that he reveals his class in *Kokoro-No-Sammyaku.* He is definitely a director sure of his skill and the theme he handles. The problems faced by a middle-aged woman with a temporary teaching assignment in a school are nothing extraordinary. There is no plot line, no high crest of dramatic tension. And the film is worthy of attention because of the very absence of elements with usual popular appeal. Yoshimura's exploration of the relationship of the teacher and the most troublesome boy is sincere. At times the film bores the viewer essentially because of the absence of any plot whatsoever but a near fluid editing compels us to sit in the hall till the end. It is not a great film but certainly not one to be dismissed casually. There are a lot of amateurs playing the different roles and it is to the credit of the director that they play well. Yoji Yamada is young and has already attracted the attention of Japanese critics. *Where Spring Comes Late* has also won for him Japan's coveted Kinema Jumpo award. This story of a migrating family from one end of Japan to another has an epic canvas in that in the process of seeking a new child greets their arrival in their new habilation the family experiences two deaths and the birth of a child greets their arrival in their new pastures. The film is in colour and that and the family's encounter with big cities like Tokyo and Osaka give the director enough scope to explore many facets of life. But there are some unnecessary details, often pretty flashback sequences in monochrome which could have been avoided.

Clippings

Inner Tension In E. Bengal

Two divergent—at times even contradictory—trends have become perceptible within Bangladesh despite the common will and effort to free their country through their own strenuous efforts and to dislodge the West Pakistani forces from its soil.

On the one hand, the Mukti Bahini —especially its guerilla forces—have been increasing their activities and have dared to initiate military action within less than 40 kilometres of Dacca and have been able to set up civil government in the liberated zones.

...On the other hand, political dissensions have emerged because some political elements could not be accommodated by the Awami League within the advisory board set up two months back at Mujibnagar. For instance, the members of the co-ordination committee of the leftists were not taken into the advisory board, though NAP (Muzaffar Ahmed group), CBP (Moni Singh group), National Congress (Manoranjan Dhar) and NAP (Maulana Bhashani group) were co-opted as members of the advisory board. These inner dissensions increased to such a pitch that Maulana Bhashani did not attend the last meeting of the advisory board probably, because he seemed dissatisfied with its membership as well as with its working.

It is widely known that the Awami League leaders were not in favour of constituting this advisory board because they claimed that because of being returned in open elections last December, they were the sole political representatives of...Bangladesh. This This contention has been controverted by other political elements now fighting against the military junta.

The advisory board of the Bangladesh government was set up under the diplomatic pressure of the USSR, mostly to get the two pro-Moscow

Biological And Chemical Warfare

N. SINGH

BESIDES napalm and other incendiaries used for direct destruction of life and property, various anti-crop and herbicidal agents and defoliants have been used by the Americans in the countryside of Vietnam, justifying their use in the name of tactical weapons to pacify the consciences of mercenaries (soldiers and scientists) and the public at large. Use of these BC weapons in Vietnam has caused vast destruction of food crops, given rise to still-children as a consequence of teratogenic effects, and led to incidence of endemic diseases like plague etc. by ecological disturbance.

BC weapons form the potential armoury of foreign aggressors and of unpopular regimes supported by foreign reactionary powers, for use against patriotic forces and against guerillas and popular insurgents in the revolutionary struggles, more particularly in the agriculture-based societies in Asia, Africa and Latin America. Vietnam has been the testing ground and a philosophy of 'limited wars' has gained ground among the forces of reaction and aggression, based on the simple principle of 'feasibility' of use of weapons in the efforts to defeat the 'total enemy comprising the combatants as well as the common people supporting them.

BC weapons are most effective in agricultural societies, most of which are semi-feudal and semi-colonial and therefore, seething with revolutionary struggle. These societies constitute the Third World, in which the present agricultural research and development is largely under the guidance of foreign experts with the latter having access to all intelligence concerned with ecological considerations of vital importance for effective use of BC weapons. In its CBW programme, the U.S. has given priority to intelligence on agriculture in enemy countries, not economic but ecological in nature, and supported research and development with that information in view (see Carc Lappe in *The Social Responsibility of the Scientists*, Ed. by M. Brown, Macmillan Ltd. 1970, pp. 96-118). The implications of the research, development and extension programmes of agriculture in the Third World countries under the guidance of foreign experts and under assistance from foreign vested interests, in a state of 'limited' or 'counter-insurgency'. war or even otherwise, obviously go against the interest of the revolutionary movements in these areas.

In case of movements against BC weapons, public complaisance, apathy and lack of concern are less easy to overcome, public conscience less easy to prick, and public opinion and pressure less easy to be aroused and built up, more so when all mass media are directly or indirectly in the hands of vested interests, because of the following situations:

BC weapons cannot be shown, in their immediate and killing effects, as directly anti-human so as to rouse the public conscience and opinion against them, since they are essentially aimed at systematic destruction of populations indirectly through starvation, diseases and teratogenic effects.

It is easy to numb public opinion by creating confusion with respect to the effects of BC weapons, since the backward agriculturist societies have been constantly shown as suffering from recurring famines, epidemics and other natural disasters and adverse living conditions.

The seeds of discrimination, based on colour/race/religion/ideology regional relations, have not so far been destroyed. Instead, they continue to be nurtured by mass publicity through TV and other media in the form of regular drone and hysteria, particularly against communism and for the superiority of advanced people of the industrialised societies a[nd] inferiority of the backward popu[la]tions of Asia, Africa and Latin A[me]rica.

The openly racist white regimes [of] South Africa and Rhodesia thrive [on] slogans of anti-communism and [the] superiority of whites over the bl[ack] and brown races. Only such feeli[ngs] of superiority could make the A[me]ricans commit the crimes of massa[cre] of children, women and old men [in] rural Vietnam. This attitude c[an]not be whitewashed by calling [them] 'deranged', as some of the 'expe[rts]' would like us to believe. These [are] open expressions of feelings of su[pe]riority and hostility. Further, [these] massacres were not earlier given c[re]dence just because they were [re]ported by the Vietnamese or oth[er] non-accepatable sources. This f[act] and the mass-viewing and acceptan[ce] by these 'advanced' people of such [in]cidents and of natural or other d[is]asters in the Third World, desp[ite] inadvertent signs of pity and bene[vo]lence for the poor and the mis[er]able, cannot be called anything [but] feelings of superiority.

The attitude of the great major[ity] of scientists continues to be irrespo[n]sible and dangerous because of th[eir] unconcern with the direct or indir[ect] implications of their activities, [and] because of active efforts to sust[ain] their mandarin status of being '[ex]perts and specialists'. This they [do] by issuing judgments in the name [of] scientific 'objectivity', 'impartiali[ty]', 'lack of evidence', etc., and also [in] the name of 'national defence'.

A review of the scientists' opini[ons] on use of defoliants and herbicides [in] Vietnam and elsewhere, particula[rly] in the American press, is very reve[al]ing. Read the latest debate a[nd] arguments of a group of scienti[sts] and consumer representatives (*Science*, Vol. 173, p. 312, 1971).

However, no movements of sci[en]tists alone, and led by scientists alo[ne] can be built up for any success[ful] struggle, including that against de[ve]lopment and use of BC weapo[ns]. Mobilisation and involvement of [the] common people is essential for

creasing the public concern and pressure on the governments and ruling forces everywhere, and scientists must become a part, an intimate part of the growing struggles. However, they have a special role in increasing the public awareness of the danger because of their present specialised knowledge and training. The emphasis in publicity should be on the reality of present dangers, and not of dangers for the future generations. The stress on future dangers may be ineffective in arousing public opinion and may also make the public indifferent to the present reality. All platforms and mass media must be utilised for this purpose, but whether this facility would be allowed by the ruling interests in the real sense is not certain.

For the scientists in industrialised countries, it should be a major problem to determine their role. They have to look anew at their socio-economic and political structures which breed the situations erupting in the present world, and then start thinking of solutions.

However, the scientists in the Third World countries have very special responsibilities in this direction as part of the people's struggles for rapid economic, social and cultural development. They have to expose the implications of investment in programmes of research, development and extension in agricultural and biological fields with foreign experts and they have to dissociate themselves from such programmes, and be alert. They must engage in research on protective measures against the harmful effects of chemical and biological weapons. They have also to engage in research and production programmes for self-reliance in diverse fields and fight for adoption and implementation of such policies and programmes. Of vital importance is, of course, their active and conscious participation in the political struggles of the common people for liberation from the clutches of semi-feudal and semi-colonial forces subserving the foreign vested interests.

Book Review

THE ENEMY
By Felix Greene
Jonathan Cape 48s Net. 341 pages.

"MASTERS of arts, on whose side are you?" Few writers of the capitalist world have given any categorical answer to Gorky's question. Most of them have avoided the answer and indulged in a kind of self-delusion. Felix Greene, along with Snow, Hinton or Burchett, is a notable exception. His illusions are few and his commitment is clear. Any book written by him, on however trivial a theme, is therefore worth reading. This book is doubly so because it is about the most important aspect of the present-day world, imperialism and revolution, and, finally, because it is the outcome of a long process of self-realisation on the part of a committed author.

He thought previously that he knew much about imperialism. But as soon as he became engaged in detailed research for this book, he realised that his previous notion of imperialism was only a minimum assessment of its actual dread and horror. "It means far more than exploitation of poor countries by the rich. It enslaves a whole social system based on exploitation and violence, a whole way of thinking about other people." (P 11) The book is an exposure of that system, particularly American, and is also a suggestion for its destruction.

The book has been divided into several well-defined sections, each consisting of few chapters and each dealing with a definitive aspect of imperialism, again particularly American. In the first section ((The Face of Capitalism) the author tries to prick a few bubbles—myths about American Society—and thus has been able to focus on various outward manifestations of the inner rot in capitalism on its home front. Deforestation and pollution, corruption in high places, crime and violence, the poor housing system, excessive addiction to drugs among the younger generation, advertisements—all these vices o[f] extremely possessive society have categorised and tabulated with tistics from various newspapers official reports. The new piece startling information is about the xican-American labourers in the orchards of California who are ing but slave-labourers and w standard of living falls far below of the poorest Negro worker. Gr has also something to say about fight under Cesar Chaves.

The development of American perialism is the subject-matter of second section. The author here cribes the contribution of vari factors to the rise of American in rialism, such as the growth of philosophy of possessive individua and the working of the state app tus for its implementation, huge n ral resources, the use of the Neg and the Red Indians as cheap lab the bank rackets, the growth of ance capital, the crisis of the old pitalist countries after the Sec World War and the consequent inh tance of their mantle by the USA a form of neo-colonialism.

The third section is confined to role of imperialism in the vast of Latin America and occasionally Asia and Africa. In the auth opinion, foreign aid is the chief w pon for the exploitation of the un developed countries. Its main ai not to improve the economies bu make them an eternal victim of A rican imperialism. Foreign aid ves it in various ways : as a means the postponement of depression seeking new foreign markets ; a concealed subsidy for the U.S. reign exporting corporations, a stranglehold of debts on indigen competitive manufacturers who compete with American industries a political and economic blackmail those countries ; as a method transforming them into the dump ground of American surplus produ in times of crisis ; and finally a weapon for military penetrat against a communist outbreak. illustration, the private companies

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World Problems and 'Mandarin' Scientists

NARENDRA SINGH

More than the nature of world crises leading to the last war, the atom bombs on Hiroshima and Nagasaki gave a jolt to the world of scientists. On the one side, the terribly destructive and explosive misuse, and on the other, the immense possibilities of its beneficial use for rapid material and cultural advancement of the great multitudes of people, became evident as inherent in application of science for the world and humanity at large.

A growing awareness of these potentials induced a serious concern among several scientists for the social implications of scientific developments. This found an expression in the birth of the World Federation of Scientific workers (WFSW) and, under its inspiration, in the formation of scientific workers' organisations in several countries.

The dangers of war inherent in a continuing tension between the two powers, Soviet and American, naturally occupied the greatest attention. From an urgency in this area, a need for broad unofficial contacts between the senior scientists of particularly the two confronting regions of the world led to the initiation of the Pugwash conferences. Now the WFSW, after 25 years' existence, and the Pugwash meetings, following 15 years' deliberations, are two non-official establishments of scientists on the world scene, having acquired an acceptable status in the eyes of govenments and the public alike.

The WFSW and the Pugwash meetings have the image of being dominated by the industrially developed and rich countries, and of acting as forums for the scientists of the 'leading' nations to solve the problems of the world. Rightly so, since the majority participation at these meetings is invariably of the scientists from capitalist countries (individuals or others representing scientists' organisations) and the Soviet bloc countries (virtually official representatives), for the obvious reasons of available facilities, resources, leisure and missionary or romantic concern, and direct or indirect material and moral support of the leading forces in their respective societies. The few participants from the Third World are most often individuals, belonging to official establishments in their countries and conditioned by subjective environments in their institutions and social structures. Glaringly absent have been the Chinese, evidently because of the great social experiment in progress in their country with its own lessons for the whole world.

Without exaggerating the role of non-official contacts among scientists in improving the climate in the areas of tension, the need for international forums, such as WFSW and Pugwash, may not be minimised. Personal contacts among scientists at such meetings do make their contribution. Particularly in the industrialised countries, these meetings give rise to public awareness, even if partly, of the problems arising from continuing misuse of science. New dangers, beside those of nuclear war, have arisen from the development of chemical and biological weapons, and from their use in wars of aggression in areas of revolution in the Third World.

Well-nurtured super-market and consumer ideologies and expansionist policies pursued by private and social corpora-

tions alike, by misuse accentuate the problems of population 'explosion', housing and health and nutrition, and those of the growing disparities of life within a country and between different parts of the world. These very ideologies and policies also obstruct or fail in supporting proper application of science and technology to solve such problems. Socio-technological paradoxes of automation, computerisation and productivity craze are reflected in the growing human alienation, in uneven technological development, and in growing unemployment even within the industrialised world. The problems of unplanned use of science and technology are increasingly evident in pollution, environmental destruction, ecological meddling, resource depletion, etc. These situations have disastrous psychological effects on individuals and on society as a whole, as exhibited in drop-outs, drug addiction, etc., in the younger generation.

Illusions of Scientists

Such dangerous consequences of misuse of science and technology have to be exposed and serious attention drawn to the need for a social policy as the principal stimulus and guide to technological developments in the world. Increasing the common awareness of these issues among the widest sections of the people, including the scientists, and building up public opinion and pressure through all possible channels remain the most important tasks of these international forums of scientists, and also of their national organisations. Such activities need to be pursued more vigorously in the common interest.

It seems that the growing relaxation in the cold war and the rapid advance of science and technology in the recent times have created illusions among scientists about their role and capacity in solving the world problems. They also appear to suffer from the egoistic feeling that they are a social category apart, unsubverted and unperverted by the class ideologies of vested interests, and that they are independently capable of leading positive actions in the interests of society as a whole. Not without reason, this 'mandarin' psychology becomes dominantly obvious, when they take upon themselves solutions and suggest collaborative actions among themselves to solve the problems of development, out of context of the socio-economic and political situations and interactions. Sometimes they do attempt to delve, evidently only partially and superficially, into the basic factors, but invariably end up with grandiose suggestions divorced from basic social issues.

At this stage, however, a distinction must be made between the scientists' calls for collaboration and assistance on a continuing basis to solve the problems of development, and the help sought for the revolutionary people engaged in liberation struggles in Indochina, Africa or elsewhere. Any action in support of the latter is the minimum of a conscious human response of scientists for solidarity against imperialist and fascist aggression. Several national and international organisations have given calls for assistance to the people in Vietnam and in the Portuguese colonies, but the response of scientists to such calls has been very unsatisfactory, even of those in the affluent countries clamouring with calls for assistance programmes for the development of the Third World. No doubt, the expression of international solidarity of the scientists on such issues could further be extended

into more positive actions only on the national levels, as those growing in the USA and Japan.

Attention is here focussed on the trends growing in the WFSW and the Pugwash movement with reference to the problems of development. In the following, references are made to one meeting each of Pugwash and WFSW just because of the incidental situations of the availability of documents and personal participation. But these meetings do reflect the general trends.

Pugwash

As against over-eating by one-fifth, malnourishment still sweeps over one-third to one-half of the mankind. This is not a new phenomenon and is known to be the consequence of inadequacy of food, both quantitative and qualitative, occuring in large sections of populations worse off in the existing economic pattern of living and class disparities. The Symposium on Protein Malnutrition (Oberursel, May 1970) evidently did not go into the need for changing the basic socio-economic pattern and class structure of society to solve the problems of food and nutrition. But what it did in its sermons was that it came forth with a horde of recommendations for adoption within the existing socio-economic pattern to apparently solve such problems.

Interestingly with a singular attention, very limited and incomplete, to the growing 'commerciogenic malnutrition', several recommendations were made for collaboration in and assistance to research and development, viz., formation of national and regional research systems and their integration into the international scientific community: bilateral cooperative and collaborative aid programmes among comparable educational and research institutions in developed and underdeveloped countries; formation of an International Science Foundation to support research in developing countries and also to serve as a pool for supply of equipment (requiring foreign exchange) to scientists facing difficulties (without going through the governmental formalities).

WFSW

Problems of young scientists in reality are part of the problems of large sections of people of the societies to which the scientists belong. Again, no solutions are possible divorced from the basic issues of society. At the WFSW Symposium on Problems of Young Scientists (Enschede, July 1971) feeble attempts were off and on made to link up the problems with social structure, particularly for the capitalist and the Third World countries. The problems of development, however, became major themes in discussions on role and tasks of scientists, where suggestions were made for intensive scientific collaboration, building up science and scientific community, internationalising universities, education and science, cross-breeding the two cultures of technology and humanity in special centres, etc. Dominant was the underlying philosophy of considering scientists as the privileged category. Also evident was an obsessive concern for assistance to developing countries, as if all problems everywhere arose from backwardness of that part of the world and could be solved by the 'magic wand of assistance' of unselfish contributions and actions from the developed countries to build up and strengthen education, science and scientific community there.

Reference must also be made to a

suggestion at the Enschede meeting in which attention was drawn to the costly nature of cultivating education and science in the modern times, and a call was made for, among other things, international cooperation in education and research, based on selective development, to expand the effectiveness of education and make possible a rational economy in research and development for future progress. This might be beneficial in class interests of certain countries. The suggestion incidentally came from a delegate from an East European country and was probably aimed at cooperation in Europe. The increasing detente in Europe and the calls for liberalisation in the Eastern democracies are probably eroding the ideological barriers and leading to convergence and confluence of interests in the industrialised and developed areas, with obviously serious implications for the rest of the world. The purpose of such approach in its totality can be rightly questioned.

Feeling of Guilt

Further attention is focussed only on the suggestions hovering round the problems of development in the Third World. Major assumptions in this area appear to be that the problems arise from subjective shortcomings and obstacles,[1] and that, therefore, assistance to governments, organisations and institutions, or even individual scientists, would be instrumental in putting those countries on correct paths of development. Internationally or nationally, whether the appeals come forth from the Third World countries or the suggestions emanate from the industrially developed countries, the main burden for action is implied to fall upon the latter. The scientists of the Third World former colonies continue to look for inspiration and guidance in all ways to the Western nations because of their past and present training and from a continuing legacy of their socio-cultural background. Whereas the scientists from the industrially developed West, probably with a feeling of guilt of their present affluence having been acquired from exploitation of the Third World, abound in the glowing spirit of benevolence and itch to change the lot of the poor, miserable and hungry.

In the latter case, a comparison may be valid with the Victorian era and its few missionaries (politicians, historians, anthropologists, doctors, people from the church, etc.). In contrast to the then prevalent lack of concern among the common people and direct antagonism and hatred of the few ruthless exploiters, these missionaries were full of benevolent intentions, felt paternal and wanted to change the nature of people with brown or black skins, and on failing in their efforts deplored the futility of trying. This very naive, but extremely harmful, attitude finds reflection in an exaggerated manner in the missionary zeal of the present-day youth and scientists of the West in their obsessive concern for involvement with the problems of development in the Third World countries. Consciously or unconsciously, this diversion also probably provides an escape to them from the socio-technological paradoxes and other mounting problems of their own societies, enmeshed in expansionist supermarket and techno-corporation ideologies.

Missionaries in the past, consciously or unconsciously, became and were effectively used as tools for colonial expansion. In recent times, there is an increasing evidence of moral and material support by governments, cartels, industrial corporations and other monopoly organisations of the developed countries to assistance

and aid programmes for the Third World through non-official and voluntary channels. They had formerly put major reliance on official channels of international agencies (UN and others) and various multilateral and bilateral processes. Such channels evidently stand exposed due to the continued worsening of living conditions of the people in that world, reducing their efficiency and reliance for the purpose of the dominant vested interests. Why could not the upsurge of new missionaries in the modern times be used for neo-colonial expansion under new mantles? It has been suggested, less so in the past and more often recently, that capitalism in its growing liberal form eliminates the need for revolutions and would contribute to general improvement in the conditions of people all over.

Indian Example

India is an apt example to cite from all points of view for an analysis of impacts and implications. There have been varied types of assistance and collaboration programmes, both official and non-official, in operation now for about two decades. There have emerged large education and science establishments and there is even 'pairing' between universities, particularly with those in the USA, and there are large funds from abroad for education and research. Assistance even to individuals has not been missing. Inspite of all this, science has failed to serve the people in India. There is an obviously growing dependence on foreign investments and imported technology, and evident is the widening economic disparity leading to pauperisation of the masses.

There is sufficient evidence to point out that the problems of development in the Third World countries arise not from a lack of science establishments, organisations and community, but from a lack of objectivity and purposefulness in the scientific effort. This situation arises, on the one side, from the weakness of the socio-economic foundations of the country which are unable to resist the combined pressures of the local and foreign vested interests obstructing correct national policies and, on the other, from the socio-cultural alienation of the educated and scientific community from the life and needs of the common people. The solutions to these problems lie not in efforts to build up science and scientific community on transplanted models, creating towers of science with scientists measuring their esoteric work against international standards, working for personal gain, fame and or satisfaction, selling their services to the highest doler, and exhibiting other ramifications of transplanted attitudes. *Instead*, the solutions lie in creating a science that serves the goals of economic and cultural development of the common people as a whole, rapidly and radically eliminating the existing and growing disparities between the few haves and the vast multitudes of have nots. Such a science shall emerge only from the revolutionary mass struggles toppling the present power structure of the local feudals, entrepreneurs, bureaucrats and professionals who are subserving the interests of the world imperialist forces, capitalist or social. Such a science would be in the hands of the people, and not in the hands of a small alienated scientific community. The present scientific community in the Third World countries has no positive role in society, but for subserving the local and foreign vested interests, unless it consciously merges itself with the interests of the common people and becomes a part of the people's

stream struggling for political power.

International Programmes

Having no aims in this direction and totally devoid of basic socio-political analysis, the programmes and actions emanating either from international platforms or from elsewhere, even for selfless material and moral support to science and scientific community in the name of development, are bound to lead only into two directions, if any: firstly, continuation and exaggeration of the transplanted nature of science and alienated attitudes in the professionals and, secondly, from the sheer needs of organisational, material and establishment factors, guidance of such programmes covertly or overtly going into the hands of vested interests to serve their purpose. Thus, in essence, the result would merely be support to the existing and widening economic, technological and scientific gap in the world with the vast masses of the Third World remaining at a great socio-economic distance from even the few local elites and affluents. Not to say that whatever the scientific community does, the process of development would be determined by the contradictions within the countries and in the world, and by the forces of revolution. This is the sunny side of the otherwise dreary picture, apparently hopeless.

These cautions and criticisms do not underrate the strong concern felt by the scientists with the problems arising from the misuse of science and technology. Equipped with special knowledge and training as they are at present, they have the great responsibility of exposing the consequences of the misuse of their labour and achievements. Public support being vital, increasing the common awareness and building up public opinion and pressure against such misuse are the essential tasks of the scientists in their national and international forums. Well-meaning slogans and movements can be be built up on the need for social policies to act as principal stimuli and guides to technological developments, to rectify the present deplorable situations when special social policies need to be devised in response to and to cope with the effects and results of a continuing misuse of science and technology. But the big question is what next in terms of positive actions and solutions.

Presently, a mounting concern with the accentuating environmental, economic, social and psychlogical problems is aptly justified, but what about the causal systems breeding and giving rise to these problems? Instead of continuously trying to cure the symptoms, as and when they erupt, is it not necessary to search for the basic causes and adopt preventive measures to eliminate them? The chief attributes of scientific methodology, i.e., objective analysis of the problems and, therefrom, evolving the mode of attack on the problems for their solution, on being extended into the realm of societies, would reveal that both the root causes of the problems and their solutions are in the economic and political situations, and that these situations presently also give rise to social and psychological paradoxes. Once this is recognised, it must also be realised that not an emphasis on scientists as a special group and on their 'mandarin' psychology of leadership to solve all problems, but conscious actions merging with the streams of growing political struggles of the common people would be the only path towards lasting solutions. When moving in this direction, the national and international forums of scientists cannot, in the long run, avoid getting

politicalised. But by then, they would also not remain special preserves of the scientists in the classical sense, i.e., an elite group or community distinct from and over and above the mass of the common people.

To sum up, public exposure of the consequences of continuing misuse of science constitutes the onerous responsibility of the scientists in their forums. In the same vein, essential tasks for them are to support in every manner the liberation struggles of the peoples who are victims of imperialist and fascist aggression and targets of weaponry resulting from a conscious misuse of scientific findings. But any involvement with the problems of development on a continuing basis anywhere, in terms of special tasks for scientists, out of social context and not as part of the common peoples' movements and struggles, is not only self-defeating in purpose but also very dangerous. In the movements towards solutions of the problems in society, as introduced in the above, politicalisation of action as part of the common struggles is the only and unavoidable path for positive solutions and progress. It is high time for the scientists in their international and national forums to consider the basic issues invloved, some of which are raised here, if they have no intention, conscious or unconscious, to stick to their present elite and alienated status in society.

SCIENCE AND CULTURE, March 1972, 115-122.

BIOLOGICAL AND CHEMICAL WARFARE

Narendra Singh
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In the present world of aggression, tension and oppression, the atomic, biological and chemical (ABC) weapons have become realities from the new advances made in science and technology with growing potentials. The dastardly use of atom bombs on Hiroshimá and Nagasaki focussed a forceful attention not only on the blatant misuse of science in that case and the potential dangers inherent in its continuing misuse, but also on the most dangerous aspect of new developments that they led to weapons only of mass destruction and extermination, instead of military value. In the following period of aggravating cold war tension, there arose real dangers of atomic war which caused serious concern among the people and gave birth to the well known powerful campaigns for nuclear disarmament (CND). Although the growing detente between the USSR and USA, during the last decade or so, has apparently

shifted the arena of tension and danger, the fears of atomic war have continued to persist unabated in Europe. They found adequate expressions in the papers and discussions at the International Conference on "The Dangers of ABC Weapons, the Real Possibilities of Disarmament and the Responsibility of Scientists", held at Berlin (21-23 November 1971) under the aegis of the World Federation of Scientific Workers (WFSW). Necessarily therefore, the problems of nuclear weapons, particularly of their disarmament and control, were foci for serious discussion at the conference. These problems have been dealt with in the past and would continue to be done adequately in future as well, covering also the themes of this conference, because of the evidently great concern among the experts of the developed countries in West and East alike. The conference themes dealing with Atomic (A) weapons are, therefore, not being included in the following.

At the Berlin Conference, an attention was also very rightly focussed on the problems of Biological (B) and Chemical (C) weapons and warfare (BCW). Not only there have been new developments in BC weapons with the further possibilities indicated, but they have also been actually used by the US aggressors in Asia, and they continue to be used there and also in Africa by the Portuguese to crush the resistance and liberation movements. Such use of BC weapons has also brought out their peculiar potentialities. An attempt is made from the Conference deliberations to present here an integrated picture of the BC weapons with reference to their nature in the context of their development, to some of the problems of their control and disarmament, and specially to the peculiar dangers evident from their present and potential use in the context of the prevailing situations and interactions in the world.

Nature of Biological and Chemical Weapons

In the pages of history or in legends and even among some of the primitive tribes of the interior, uncontaminated by outside influences, one may point to the evidence of use of weapons and warfare, which could be categorised as the crudest forms of the modern BC weapons and warfare. However, in bearing upon our present and future problems, we restrict ourselves here to the development of BC weapons beginning with the first world war of 1914-18. We refer essentially to those biological and chemical means or agents which are employed for mass effects, extermination or disabling of the 'enemy' populations, aiming directly at the human beings or indirectly through a negative change of the ecological balance or the food supply affecting the people. Although a clear distinction in terms of use and final effects may not be possible, we present here, for the sake of convenience, the biological and chemical weapons under separate heads.

Biological Weapons

The traditional concept of biological weapons and warfare refers mainly to the bacteriological aspects, i.e. use of bacteriological agents to cause mass epidemics. This narrow concept seems to be still dominantly prevalent, as reflected in papers and discussions at the Berlin Conference as well. Attempts were, therefore, made at the conference to correct this impression by drawing attention to the new developments and dangers, already glaringly evident during the period following the II world war. It is obvious from the trends of use and development that the modern biological warfare could involve bacteriological or other biological agents in attacking the human populations directly or indirectly, or in destroying their food supplies.

The bacteriological warfare can, now, be extended to include all means, direct or indirect, causing mass epidemics among the human populations. Direct use of bacteriological agents to cause epidemics of endemic diseases appeared not only feasible, but also as real danger, during the I world war and the period following it. The Geneva Protocol of 1925, still not signed by some countries, was aimed at outlawing this type of warfare, i.e. hostile intentions and acts of dispersing,

by various means, specific disease organisms to cause mass epidemics among the enemy populations. There is no reason to believe that such dangers have reduced, with alleged use by the US forces in Korean war. An attention is, however, more particularly focussed on another form of bacteriological warfare, causing mass epidemics indirectly. The use of defoliants by the US aggressors in South Vietnam has led to replacement of forests by secondary growths favouring a rapid increase in the rat and other rodent populations. As a result the bubonic plague, not a major health problem earlier, has become a cause of serious epidemics among the local populations, not affecting the already immunised US servicemen. Thus in modern concept, the bacteriological warfare must include this implication as well and must refer to all hostile acts against human populations, aimed at spread of communicable endemic diseases among them to cause mass epidemics, directly through dispersing disease organisms or indirectly by disturbing the ecological balance to cause conditions favourable for their vectors, etc.

An urgent attention has also been drawn to another serious form of this warfare, *using bacteriological or other biological agents to destroy the food supplies.* This could take the form of dispersal acts to introduce and proliferate in the enemy territory, communicable endemic plant diseases, insect pests and communicable endemic animal diseases, aiming at spreading epidemics to destroy the local food supply. The experts have known the possibilities, particularly of the cereal rusts among the plant diseases and of the Colorado beetle among the pests, as important agents, which on proliferation under favourable conditions can considerably decrease the yields, and in case of flaring up may even destroy the whole food crops. These possibilities are not mere figs of imagination and are adequately substantiated by disjointed reports from various parts of the world and by the most documented ones from U.S.A. Some US scientists have already drawn forceful attention on the developments and dangers from the work already going on in a systematic manner in their country. They refer to the presentation of the Distinguished Service Award (US Army's highest civilian medal) to a Fort Detrick researcher for developing a new race of the causal agent of rice blast (a fungus disease of rice, the staple food in Asia). Not only this, they have shown from a systematic survey of the US Army research literature that all intelligence concerned with the ecological considerations of food crops has formed an important part of the programme of surveillance of the enemy territory, particularly USSR and China, for a long time in the past.

In the light of present and potential use and development of the abovementioned approaches, the modern biological warfare acquires a comprehensive definition to include all direct or indirect employment of bacteriological and other biological means against human populations, aiming at the man physically or through destroying the food supply. The validity of real dangers of such warfare has already been shown by the evidence of use and analysis of the trends of development.

As future implications of the new trends of molecular biology and genetics, some speculations have been made about the future possibilities of biological manipulations and their use against man. Without minimising the importance of these dangers likely to become acute tomorrow, it has also, however, been rightly recognised that there are other dangers which are urgent already today. Beside the blatantly criminal use of herbicides and their harmful genetic effects on present generations, as introduced later, the common people everywhere continue to be victims of additives or contaminants poured into the total environment (drugs, food, water, air all alike), with known and unknown genetic and other effects. If we can change the situations fomenting the present dangers, the future ones are of minimal importance and within control.

Chemical Weapons

In contrast to the biological weapons, with only some evidence of use, the chemical weapons have been continuously used, in

one form or the other, by the aggressors in the 'enemy' homelands against the local populations. The age of modern means of mass extermination by chemical means was introduced near Ypres on 22 April 1915, when for the first time chlorine gas was used by the imperial German troops. During the rest of the I war, a number of poison gases (chlorine, mustard gas, etc.) were used at several places. After this war, the search continued for toxic chemicals, which could cause injuries on inhalation or by contact with skin or by action on mucous membrane. By modification of the older gases and by preparing their analogues and homologues, several poison gases were perfected, e.g. Nitrogen Yperites, various forms of Lewisites, and a number of nose and throat irritants. The poison gases were used by the Italian aggressors against the Abyssinians in 1936, and by the Japanese invaders against the Chinese in 1937. The US forces had used the CN and CS gases and other variants in the Korean war, and they still continue using them in Vietnam and other Indochinese states.

The effectiveness of the incendiary bombs during the II war in destroying cities, buildings and fortifications, provided a lead to the war maniacs and experts towards inflammatory chemical weapons of mass destruction. This is reflected in development of inflammatory mixtures based on mineral oil products, in development of metallised inflammatory mixtures and in that of inflammatory substances on the basis of thermit and white phosphorus. Napalm, belonging to the second group, is well known to the people all over the world from the picture-flashes of its terrible effects on victims of its heinous use in Vietnam by the criminal US aggressors. Napalm was also earlier used by the US against Koreans. It has been used against the Arabs by the Israelis, It continues to be used by the US forces against the Indochinese people, and by the Portuguese against the Africans.

The spectacular developments from advances in chemistry, specially biochemistry, leading to a build up of a new armoury of the chemical weapons after the II World War got overshadowed in the first stages by the benumbing fears of the nuclear war. This refers to the synthesis of new toxins and biosubstances capable of acting on enzyme systems of the living organism. During the fifties appeared a mounting evidence in this area, beginning with the developments of fluoro-derivatives, capable of acting as inhibitors of the carbohydrate metabolism, and of several phosphoric acid esters, capable of producing neuroparalysis. Tabun, Soman, Sarin and other substances, belonging to phosphoric ester group, have been extensively used by the US forces in Vietnam. Even the classical sulphuric mustard gas in combination with Soman or Sarin has been used and found more effective by the US aggressors for the lasting poisoning of the country side. Vietnamese scientists have provided, in a most competent manner, most reliable evidence of use of such chemicals and mixtures in the country side by the US forces and their puppets.

Defoliants and herbicides are some of the common chemicals used in agriculture to strip plant leaves and kill weeds. Well known compounds of this group are picrolam, cacodylic acid, and 2, 4-D and 2, 4, 5-T butyl esters, etc. Since 1967-68, these chemicals have been extensively used as biochemical weapons in Vietnam to defoliate the forests to expose the resistance fighters for attack from planes or otherwise, to destroy the food crops to starve the local populations, and to disturb the ecological balance to create various short and long term adverse effects on the local populations. The natural fauna and flora, over the land and also within the soil, has been extensively damaged in Vietnam to have lasting effects. Alleged not to be toxic to humans in short term direct effects, their immensely harmful character in causing extensive teratogenic damage and serious genetic effects has been fully proved in competently presented case histories of affected people and populations by the Vietnamese doctors. In the face of this situation, the controversy raging in the US science on the possible damage from dioxin in 2, 4, 5-T is merely an exposure of the utter unconcern of the experts and scientists on the criminal use of such chemicals and of the

humans, particularly in Asia and Africa, as guineapigs. What else one can say, when these chemicals continue to be used there in various combinations for different tactical purposes, under the names of "Orange", "Purple", "White" or "Blue" according to the formulations. US forces and their puppets carry on this type of chemical warfare in Indochina, and the Portuguese forces in Angola, Guinea and Mozambique in Africa.

Not limited to the above ones, having been or being criminally used with hostile intentions against the local populations, the armoury of chemical warfare is much more extensive, ready for use or potentially under constant development with advances in chemistry, biochemistry and technology. To the highly toxic phosphoric group of neuro paralytic poisons, has already been added the Tammelin ester, most powerful nerve paralysing toxin known so far. This has opened the new field of organo-phosphoric compounds of the so-called V substances in the offensive war agents of central importance, specially in USA and the NATO countries. These substances, with the toxicity range of 0.01-0.05 mg/kg (LD_{50} dose), can be equated with small to medium range nuclear weapons in their physical destructive power of mass extermination. In the search for new compounds in this class, further developments will probably be aimed at "antidote-resistant V war substances" to countermand any possibilities of prophylactic safety or therapeutic influences.

The classical poison gases (sulphuric mustard, etc.) with the above nerve paralysing toxins in tactical mixtures have been found very effective and are to receive more attention to increase their toxicity and lasting effects in the country side. Irritant poisons, like orthochlor-benzylidenemalodinitril, are already in the armoury and would further be developed and produced for use against civilian populations to create panic and disorganisation. Research into metabolism of nervous system and substitute metabolites has led to discovery of psycho-poisons that cause serious psychic disturbances when present even in minute quantities (thousandth mg/litre) in the air. Undoubtedly, the piperidyl-benzilates do not signify the end of military toxicological research in this area. The algogenes and allied nerve irritants, causing induced pain, must be given equal importance alongside the psycho-poisons. Synthetic toxins, based on peptides of eight to ten amino acids, are already available in the laboratories, and the fusion poisons, showing their reaction on union of two otherwise non-poisonous primary substances, are speculative but sound and practically real possibilities. Substances like dioxin, having teratogenic and other adverse genetic effects, occur as impurities in the synthetic herbicides, and are also deliberately added to them, when used in Vietnam, to make their effects more insiduous. With the present knowledge and means, large scale production of dioxin and more potent related compounds for military use is easily possible. At present considerable significance is attached to natural toxins (alkaloids like strychnine, eserine, etc., glucosides like digitalis, strophantin, etc., curare poisons and others like diphtheria toxin, botulin toxin, etc. etc.), incomparably stronger than synthetic poisons to overcome the existing disadvantage of greater difficulty in gaining them from the natural sources.

The present situation is aptly brought out in the following excerpt of a paper at the Berlin Conference: "Whereas 10 or 15 years ago one was able to survey the poisons which were in question for military use, and exactly characterise their most important representatives, in the last years it has become ever clearer that in view of the breadth of scientific development in the field of biologically active compounds it is now extremely problematical to evaluate precisely the agents which come in question for war use. There is an additional military value to an aggressor of the chemical weapons; that is, the danger growing out of military toxicological developments is to a great degree anonymous and therefore the difficulty of organising comprehensive and all-sided protection from such means of mass extermination increases." (Kh. Lohs, GDR).

Problems of Control and Disarmament

Clearly, there were still some experts who altogether missed the implications of new

developments and talked merely of the bacteriological warfare in the context of the Geneva Protocol of 1925. For them, the BW disarmament is a real possibility of the near future and the Draft Convention on BW is a model for that on chemical weapons as well. However, attention was forcefully drawn to several special problems connected with the control of BC weapons. They referred to the questions of guarantee of destruction of stock piles, to the possibilities of multiplicity from materials used in laboratories and medicine, and to the difficulties in ensuring ban and control, when even small quantities can induce 'diseases' and 'famines' indistinguishable from the naturally occurring ravages in the poor countries of the present or under the scourges of pollution, over-populations, etc. in the world of tomorrow. An attention was particularly drawn to the real dangers from secrecy connected with the development and testing of BC weapons and lack of verifications under such conditions. It was also emphasised that the separation of chemical from biological warfare, with reference to control and disarmament, was not only irrational, but highly dangerous.

The arguments against destruction of stockpiles on economic grounds, pointing to the unstability of chemicals and adequacy of supervisory control, and those for using the oceans as the free global refuse pit, were effectively countered drawing upon the experiences of GDR who had to tackle such problems as left overs from the Nazi armoury. Total destruction of the stockpiles was pointed out to be the only solution in the interest of humanity, irrespective of the loss in profits from such "poison breweries" to the big business. It was also commonly realised that there were no half way approaches, but total ban and prohibition of manufacture and use of BC weapons of all sorts and total destruction of the existing stockpiles, as part of the complete disarmament.

The general feeling of condemnation of use of BC weapons was forcefully reflected in signing by all the participants, representing 22 countries, of an appeal which called for immediate and complete stoppage of the poison warfare by US aggressors in Vietnam, for unconditional withdrawal of the US troops from South Vietnam, and for the US Government to desist from supporting and arming its puppet regime in South Vietnam.

Continuing Dangers of BC Weapons and Tasks for Scientists

Recognising the longdrawn nature of the struggle for total ban on BC weapons and warfare, attention was rightly focussed on the peculiar dangers evident in their present and potential use in the context of local and world social situations, and on the possible tasks for the scientists on national and international levels.

Dangers of BC weapons in the III world

It was pointed out that although the small developed countries of Europe do fall within the gambit of BC warfare, from their practical incapacity to establish and organise effective defence, the greatest dangers lie in the developing countries of the III world, particularly with the involvement of a super-power. Vietnam has been and continues to be the testing ground, with extensions to include Angola, Guinea and Mozambique in Africa as well. As part of the philosophy of 'limited wars' or undeclared wars and other hostile activities of the oppressors and aggressors, the use of biological and chemical agents is justified in the name of 'tactical weapons' guided by the simple principle of 'feasibility' in all efforts to defeat the total enemy, comprising of the combatants plus the local populations. Thus BC weapons form the present and potential armoury of the foreign aggressors and of the unpopular regimes supported by the foreign reactionary powers against the patriotic armies, guerilla forces and popular insurgents, more particularly in the agriculture based societies of Asia, Africa and Latin America. These areas are the obvious centres of revolutionary struggles, present or potential, upsetting the applecarts of the interests of super-powers and their local lackeys, and of the dominant vested interests in the bacground.

For the aggressors, the agricultural societies appear amenable to easy devastation by BC weapons. The state of underdevelopment, wide-spread poverty and agriculture dependence is inherent with conditions, aggravating the effects of BC weapons causing famines, disease epidemics and other damages. The semifeudal and semi-colonial character of most of these societies in the III world has placed their agricultural research and development, among other things, under the guidance of foreign experts, who have access to all intelligence concerned with ecological considerations of vital importance for effective use of BC weapons. Foreign vested interests operate in a big way in these countries. The local experts, from their social background and because of their training and education, are easy preys to the manoeuvres of the vested interests. The implications of such situations are apparently against the revolutionary forces and somewhat favourable to the imperialist aggressors and their local lackeys.

In efforts to build up powerful movements against BC weapons, special attention was drawn for cautions against the following socio-psychological situations. It may be less easy to rouse the public conscience against BC weapons, since they are in their effects, instead of being directly killing and anti-human (as A-bombs are), essentially aimed indirectly at systematic destruction through starvation, disease and teratogenic effects. It may be easy to benumb the public opinion by confusion between the effects of BC weapons and those of the already well publicised recurring calamities of famines, epidemics and other natural disasters, and adverse living conditions in the backward agricultural societies. Real dangers do exist in conscious or subconscious feelings of discrimination based on colour/race/religion/ideology/region, conttinuously nurtured by mass publicity through TV or other media in the form of systematic drone, particularly against communism and that on the superiority of people of the developed rich countries and the inferiority of the backwards from the underdeveloped poor countries of Asia, Africa and South America. (Through TV or other media, in a well-calculated manner, are splashed the racist incidents of the type of My Lai or others in Vietnam or in South Africa or in Rhodesia or elsewhere, and are screened scenes of poverty or natural or other disasters in the III world countries; the 'advanced' people accept all this as part of their entertainment pattern of modern living, of course interspersed sometimes with sighs of pity and benevolence for the poor and miserable; can that be anything else, but open expressions or hidden inadvertent reactions of well nurtured feelings of superiority and continuing efforts in sustaining them). The attitudes of great many scientists and experts are irresponsible and dangerous, showing unconcern with the implications of their activities and/or creating confusion or subversion by issuing judgements in the name of 'objectivity', 'impartiality', 'lack of evidence', and sometimes even for 'national defence'.

Tasks and Responsibilities of Scientists

As part of persistent tradition, the trends of elitism were evident in suggestions calling for international cooperation among scientists and technicians in the name of peace and internationalism, and for their special rights to participate in meetings that exceed the political boundaries. Demands were for all research to be open and public, with no secrecy, and for establishment of an international centre to deal with documentation, evaluation and processing of all issues related to BCW, and its results to be made public. An emphasis was on constant publicity of potential hazards from all research in BCW, even for defence, so long as total ban on all forms of BCW is not achieved.

Active participation by scientists in movements for total ban on BCW, not in movements of scientists alone and led by scientists, but in popular movements is of course the most important task. Mobilisation and involvement of the common people is the most important pre-requisite, as even the CND has shown, and the scientists with their special knowledge have an important role in this direction. All platforms and means have to

be used for this purpose and to expose the continuing dangers. But in the face of conrol of ruling interests over all means of mass media, a significant question is how to break this farce of free debate and democratic freedom, for most effective publicity against BC weapons.

As demanded by the Vietnamese colleagues, thorough investigations into the immediate and latent effects of BC weapons and search for effective means for reducing their harmful influences, become immediate research tasks for the specialists everywhere in the present world situation of continuing dangers. Beside such a research engagement, the scientists in the Third World countries have to be on constant alert and must expose the implication of the foreign-sponsored and involved research and development programmes. In the wider sense, they have to dissociate from and constantly expose the situations, liable to overtly o or covertly come under the influence of big business of the vested interests, local and foreign. They must realise that no progress in this area is really possible, unless they actively participate in the common people's ~~activities~~ political struggles for freedom from the rule of semi-feudal and semi-colonial forces in their country, which in reality subserves the foreign vested interests. The scientists of the developed countries as well, have to begin looking at their socio-economic structures, which breed and support the big business of private or state owned monopolies and technocorporations, whose most profitable business is armaments and war. This, as also the other basic issues of social implications of science, emphasise active participation of scientists of the developed world everywhere, in struggles to eliminate their own overtly or covertly imperialist(or imperialism-subservient) ruling interests and regimes, as very rightly recognised by some US scientists in their proposal "that scientists, together with other peo le, should actively work for radical political change in this country"(Shapiro, Eron & Beckwith, 1969).

Notes and References.

At the Berlin Conference, most important documents consisted of "Chronology of US Chemical Warfare in South Vietnam from 1961 to mid-1971", prepared by the DVRN Commission for Investigations of US War Crimes in Vietnam, and the paper "Serious genetic effects resulting from the

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REPORT ON VISIT TO SWEDEN (1-4 MAY 1972)

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MEI 1972

REPORT ON VISIT TO SWEDEN (1-4 May 1972)

I.B.V.L. team: Messers Philipsen, Rastovski, Sijbring and Singh.

Local organisers: Prof B. Hällström (Chemical Centre, Lund) and Mr. Jan Tear (Alfa Laval).

Programme:

2 May: - Discussions at Alnarp, visit to Leaf Protein Pilot Plant and Division of Food Engineering (both at Alnarp), and seminar by Singh at the Chemical Centre, Lund.

3 May: - Visit to Plant Physiology Centre, Lund, SummaryDiscussions with Hällström and Tear, and visit to Alfa Laval, Lund.

A. Information from discussions with Hällström and Tear

1. Hällström group collaborates with Alfa Laval and also gets support from the Swedish Development Agency. With an equipment capacity of handling 500 - 1000 kg of vegetation per hour, the two objectives of their programme are (1) by milling and extraction to get optimal yields of green leaf protein for feed purposes, and (2) by heat fractionation of extract to get functional white (yellow) leaf protein for human consumption.

(Additionally, it came to be known that Anhydro (Denmark) equipment for processing 2-4- tons vegetation/h, constituting the old pilot plant of Hollo (Budapest), was to be replaced by a factory of capacity of 6-7 tons/h, to be set up by Alfa Laval sometime by September 1972, in collaboration with Anhydro. Anhydro would supply the drying equipment and Alfa Laval the heat processing and separation equipment).

2. Raw materials: The plans, presently based on lucerne because of its world wide appeal, may also include Amaranthus sp. and Artiplex sp. because of their promising nature. The question of use of by-product green from potato was also raised.

3. Processing: Between the hammer mill and the IBP Pulper, the latter was reported more efficient in terms of extraction of nitrogen (N), although there was some heat generation. (A point from IBVL experience was made reg. direction of rotation). A double screw press was in use for single pressing out of the juice.

For coagulating the protein in juice, heat exchanger to 45-50^{o} followed by steam injection (both Alfa Laval equipment) were employed for economy in terms of volumes to be handled. Decanter and/or other centrifuges (Alfa Laval) were used for separating the coagulated protein as a product with 25% moisture.

Fractionation with heat exchangers was unsatisfactory in operations and still needed to be standardised to get the white leaf protein.

It was considered desirable to have certain norms for pulping efficiency (undecided), for efficiency of pulping-cum-pressing (beside N, the suggestion was for pigments as well), and for efficiency of coagulation and separation of protein (beside N, suggestions were for some factors concerning the nutritional quality).

4. Product handling: Leaf protein slurry (25% moisture) from decanters or centrifuge was being spray dried. No washing was done. Experiments with layer hens have shown satisfactory results.

After standardising the processing conditions for white leaf protein, the product testing for human consumption is planned (around September) with support from the Swedish Development Agency for such feeding trials.

No work so far on liquor, but the plans include testing of evaporators and assessing the over-all process economy. For possible directions, the Hungarian experience forms the background, where in one case, the liquor is evaporated and mixed with the roughage for ruminants, and in the other, it is fermented and the harvested yeasts are mixed the green leaf protein for use in Vepex Mix Feeds for non-ruminants.

No work is proposed on the use of pressed fibrous residue, which is assumed to be suitable for ruminants.

B. Discussions with K. Lexander's group (Plant Physiology Centre)

The main objective of this team is leaf protein for human consumption, paticularly to replace imported soy and other proteins, They are engaged in basic research, covering broadly the following areas.

1. Choice of crops: Screening of glass house grown crops under different N fertilisation levels, and of some field crops, (using an electric meat mincer and additionally a disintegrator for preparing pulp and subsequent hydraulic pressing for juice), is done for total protein and leaf matter, N extraction, and also fractional heat coagulation characteristics. The latter is done by heating the juice to 53^{o}, centrifuging down the chloroplastic material, and heating the supernatant fluid to 80^{o} for the white cytoplasmic fraction.

2. Processing conditions: With the aim of getting white leaf protein for human consumption, the work is mainly directed towards sophisticated fractionation. Presently, the basic investigations involve separation of four membrane-bound fractions of chloroplastic material by differential centrifugation and four soluble protein fractions from the supernatant fluid by molecular sieving through different grades of sephadex, etc. The fractions are subjected to particle size measurements, particularly in case of membrane-bound materials, and to quality assessment.

3. Quality assessment. of different leaf proteins and various fractions is done and proposed, using Tetrahymena organism for general nutritional quality, pepsin-pancreatin technique of Ackeson & Stahmann for digestibility, and microbiological assay for methionine.

4. Protein biosynthesis: Plant physiological studies, including various enzyme assays, are done and proposed on plants grown under different climatic conditions (varying temperature and day lengths, in phytotron) to determine conditions for maximum protein production in photosynthetic organs.

A.B. The remarkable feature in objectives of both teams was for maximising local protein production and for decreasing the dependence on imported soya and other vegetable proteins.

C. Points from concluding summary discussions

1. Raw materials.

Alfa Laval's main interest was in Lucerne.

IBVL's interest centred round fodder grasses and lucerne (in combination with artificial drying), and on waste disposals from green vegetables.

Because of intensive work in Holland on more green matter and more protein in grass, already done in the past, it was considered relevant to have a summary of grassland research data in Holland with particular bearing on leaf protein potential.

2. Processing & equipment.

Standards and norms for different steps in processing are still open questions, for possible exploration by both the teams. It was, however, considered desirable to have the IBP pulper as the standard equipment for comparison.

IBVL work was still in a very exploratory stage, so presently no ideas could be formulated on the possible forms of technological collaboration. It was agreed that contacts be maintained for mutual exchange of information and experience. Alfa Laval would see the possibility of renting out decanter centrifuge, etc. for trial runs at the I.B.V.L.

3. Sample exchange for evaluation was a fruitful area for collaboration, particularly for drying of wet products prepared by Hällström, even at this stage. No work is intended at Lund on the pressed fibrous residue, but IBVL would positively go in this area to study the problems in its use as roughage for ruminants. Both Alva Laval and IBVL would continue work on feed uses of green leaf protein and also on possible human consumption of white protein.

4. Some more concrete forms of collaboration could be discussed later in October 1972, during Hällström's visit to Wageningen, in the light of greater experience both at Lund and at I.B.V.L.

Wageningen: 31 May 1972. (Narendra Singh)

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P U B L I K A T I E   2 6 4

"PERSPECTIVES IN LEAF PROTEIN TECHNOLOGY"

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Augustus 1973.

PERSPECTIVES IN LEAF PROTEIN TECHNOLOGY

(Paper read at the International Congress "Chemical Engineering for Human Welfare", Paris 2 - 9 September 1972, organised by the European Federation of Chemical Engineers).

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The vegetative stage in plants is most efficient for bulk food production and for total bio-production[1]. In this stage, involved in the organs of most active metabolism are also a large number of enzymes, i.e. a large amount of proteins in the green parts. Occurrence of these proteins in intimate association with large mass of fibrous materials of cell walls renders them unfit for direct food use by humans. In nature, they undergo either complex changes within the plants to seeds, etc., or inefficient conversion in ruminant animals to milk or meat, to yield fibre-free or low-fibre food materials suitable for man.

For a direct and efficient use, the green parts need special treatments employing either the principle of fractionation, mechanical or chemical, into extracted fibre-free products and fibrous residue, or that of hydrolysis, chemical or fungal enzymic, to break down the cell wall constituents into simpler products to render the whole mass non-fibrous. In research and development, almost all attention has been given to the mechanical principle of fractionation, with a research group only recently proposing schemes of fractionation[2]. As a result of consistent work over the last thirty years, N.W. Pirie and co-workers at Rothamsted have developed so far the most integrated leaf protein technology, which forms the basis of work at several centres in the world. During the last decade, new groups have used variations in techniques in accordance with their aims.

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The work done on various practical aspects of leaf proteins at different centres has been compiled in a recent report[3].

The possibilities have been shown of extracting leaf protein from green forage, in amount of about 2 tons/ha/year in temperate regions and of over 3 tons in tropics, and from by-product greens of crops grown for other economic purposes. Animal experiments have confirmed the analysed amino acid spectra in the adequacy of leaf proteins in all, but methionine, and have shown their nutritional efficiency as protein supplements and as a source of carotene pigments. Feeding trials with children have further confirmed their protein and lysine supplementary efficiency for cereal diets. With the present knowledge and technology, it seems possible to initiate, in proper agricultural cycles of selected vegetations, production of leaf protein for feeding non-ruminant animals and for supplementary nutritional programmes for human populations, using the pressed residue as fodder for ruminant animals.

The nature of problems for developing further satisfactory programmes, integrated in efficient production and use of all materials and products, indicate two facets. One involves agricultural research for maximising the yield of vegetation, and the other for maximising the yield of quality products, the technological research and development. The latter would essentially be guided by the aims, which include production of leaf extract, coagulated pigmented leaf protein, decolourised material, fractionated chloroplastic and cytoplasmic leaf proteins, protein isolate or other technological raw materials. No work has been done on the questions of protein isolate or other technological raw materials. The possibilities of fractionation by differential centrifugation or by differential heat coagulation of extracts have been shown[4], suggesting integrated production of pressed residue for ruminants, inferior quality chloroplastic material for non-ruminants and the superior cytoplasmic one for humans.
The conditions of fractionation, however, need to be standardised and the appropriate technology designed and developed. Decolouration of coagulated leaf proteins is easy by washing off the pigments with lipid solvents, and the preliminary studies have shown the possible approach for azeotropic solvent extraction of wet protein with mixtures like acetone: hexane, to get undamaged and conserved pigment concentrates, fit for feed and other uses[5]. The most direct approach obviously is production of leaf extract and/or coagulated leaf protein, the integrated technology of which in prespective is the theme of this discussion.

The problems of processing for production and use refer, in one case, to leaf extract and pressed residue, and in the other to coagulated leaf protein, deproteinised fluid and the pressed residue. Extraction is the first stage of processing, common in both cases, and the treatment of extract to coagulate and separate proteins, an additional one only in the latter.

(1) Extraction Technology

Among the three practical approaches of separating extracts, the pre-press mechanical pulping to break open the cells[6,7] has obvious advantages, over pre-press milling & grinding[8] or mere roller-pressing of shredded vegetation[9], in yielding properly disintegrated vegetation mass for better yield of fibre-free extract. The joint operation of pulping-cum-pressing simultaneously in one unit over a period in batches of vegetation[10], gives much less yields because of auto-denaturation and retention of proteins in the pressed residue. Auto-denaturation and autolysis, also in drying, point to the need for minimum delay in processing after harvest of fresh green vegetation.

The pulping must be done quickly, taking in vegetation and rapidly throwing out the pulped mass for integrated pressing in quick succession, for efficient extraction and to prevent impairment in quality. Presently, equipment for two scales of operations are available, one for pulping 1-2 tons of vegetation per hour[6] and the other for 100-250 kg[7]. For increasing the capacity of pulping, if necessary, particular technological attention in that direction is needed. Another line is for improvements in pulping efficiency, for which the first demand is for distinct norms for measuring it, since conventionally only the total extraction efficiency, as resultant of integrated pulping and pressing together, is measured in terms of nitrogen. Techniques to study the nature and extent of disintegration and rupture of cells might help in providing basic information to improve the pulping technology.

The pulped mass is pressed for getting the extract out. A large belt press[11] has been designed for integrated operation with the large pulper, and its prototype for the small pulper. Instead of a perforated faced pulley, as that on the original press[11], a grooved one is claimed to be better[12]. The group, employing pre-press milling & grinding technique, prefers multi-stage pressing using screw press[8].

Evidently there is a considerable scope for improvements in pressing technology (integrated with pre press handling) for the principal demands of efficient extraction of fibre-free proteins and of rendering the pressed residue, structurally in a better form with reduced moisture. While trying the available designs or developing new ones to meet the principal demands, other conditions of extraction have also to be taken into account, as touched upon in the following.

Earlier exploratory studies have indicated the possibilities of better extraction at higher pH, from improved solubilisation of proteins, and in one of the practical programmes the shredded vegetation is ammoniated before roller pressing for improvements in colour and pigment stability [9]. The effects of ammoniation or alkalisation in large scale processing, on both extraction and over all quality, need to be carefully assessed. If found advantageous, suitable technological adjustments are necessary for introducing ammonia or other alkali, immediately prior to or during the pulping. The possible advantages of detergents/surface reactants or other specific compounds for releasing the proteins from complexes also need serious investigations, and if promising may necessitate de novo standardisation of the whole processing technology.

Of basic importance would obviously be the studies on the peculair physico-chemical and biochemical characteristics of cell wall and cellular constituents in their effect on extraction and quality of the products. Such information would pave ground for real improvements in techniques and for subsequent developments of technology.

(2) Technology of coagulation and separation of leaf protein

Coagulation. The proteins in leaf extract are either coagulated by heat or precipitated by adjusting the pH to 4 - 4.5 with any acid. For heat coagulation treatment of extract in bulk, the principal approach is to inject steam under pressure into the extract to instantaneously raise the temperature of mixture to above 80 °C, both to inactivate the enzymes and to get easily separable curds. Simple steam-injection devices [13,14,15] have been developed. The use of heat-exchangers, in part or fully, may reduce the energy input, but their real efficiency needs to be assessed.

Heat coagulation is the simplest and commonly used technique, but acid precipitation might become necessary when either the heat coagulation fails or a reversible denaturation is desired from demands of subsequent mode of use. Some information on differences in precipitation under different conditions and in effects on quality is available[16,17], but much more is needed for appropriate technological improvements, particularly with reference to the proposed studies on effects of varying conditions of extraction as suggested in the above.

Separation of coagulum. In small production programmes, simple contrivances of gravity filtration and beam-press are used, holding the steam treated extract in cloth stockings from start to finish[3,5]. On large scale, either filter press or centrifuge can be satisfactorily used for separating the heat coagulated material, but only the centrifuge for acid precipitated one because of the fineness of the latter particles. A continuous drag separator[18] has been recently reported for use in production of unwashed heat coagulated leaf protein, but evidently unfit for getting good quality pressed and washed material free from soluble constituents.

The possibilities of protein quality impairment from interactions with soluble constituents are there during handling and processing of the extract. The need for adequate washing of the coagulated leaf protein must be further emphasised from results in a recent paper, giving some evidence also on the implications of phenolics[19]. Basic information on the nature of interactions between proteins and soluble constituents in leaf extracts, particularly under different conditions of extraction and coagulation, is very much needed for improvements in techniques and technology to prevent or minimise the adverse reactions. For practical attention, however, the facilities for coagulation, immediately following the extraction, and for rapid separation of the coagulated protein from the fluid and for subsequent efficient washing of the separated protein have high priority. From technological point of view, most serious attention is necessary for the stage immediately following coagulation, i.e. rapid and continuous separation of the coagulating material immediately from the mass of deproteinised fluid, and then for the techniques of washing the material free from residual soluble contaminants.

(3) Technology of processing the products further for use

As mentioned earlier, the products of primary processing are in one case, the leaf extract and pressed residue, and in the other, the coagulated leaf protein, deproteinised fluid and pressed residue. On utilisation aspects, almost all work in the past has been on the coagulated leaf protein. For satisfactory programmes, all products of processing must be used and, to be fit for the desired and specific use, may need further handling and processing, as discussed in the following.

Leaf Extract. Separated from the pressed fibrous residue, it contains both coagulable and non-coagulable plant constituents, nitrogenous and others. Some evidence of the dry leaf extract, as a product of multi-stage processing, satisfactorily replacing 25-30 % of oilseed meals in pig feeds has been given, and its use as milk replacer for young cattle and as protein-cum-pigment source in poultry feed is indicated[8]. These areas of use need to be systematically investigated and the problems identified, particularly with reference to the nutritional implications of the accompanying soluble constituents.

The fluid extract, containing 8-9 % dry matter and 2.5-3 % crude protein may be used direct in liquid animal feed systems, fresh or after sterilisation and preservation treatments, if necessary. For the latter, knowledge gained from fluid milk processing may be gainfully adapted. The non-fluid use of extract involves further processing towards drying. In one practical programme, the coagulum slurry is separated after heat treatment of extract, and the deproteinised fluid after vacuum drying to 50 % solids is mixed with the coagulum slurry before spray-drying the whole mixture[8].

The real advantages of this multi-stage processing need to be carefully assessed, compared with simple spray-drying of the whole fluid extract. Other possibilities are to intimately mix the fluid extract into starchy or other base materials in proportions, which on simple drying yield products of the desired nutritional make-up.

Coagulated Leaf Protein. Adequately processed and washed, this product would have over 60 % protein and over 1 mg beta-carotene per g dry matter. For optimal nutritional efficiency, it must be used as a protein supplement and not as the main protein source[20]. Even at low supplementary levels, it is an efficient beta-carotene source[21] and evidently an adequate source of the nutritionally important pigments, like carotenes and xanthophylls[22].

It has obvious value in nutrition of man and of the non-ruminant animals, like pig and poultry. So far presented mainly for human use to meet protein demands, particularly in the areas of widespread under- and mal-nourishment, there has been a failure in any progress, just because the issues of food and nutrition, as others there, are primarily socio-economic and political in origin and for solutions, and not amenable to mere technological approaches. However, the technological problems for attention must refer to uses, both in human food and in non-ruminent feeds, more particularly the latter because of their current and increasing dependence on grains and other materials, directly useful for man, and of potentialities of increasing food production efficiencies of such animals in terms of land use.

As heat coagulated and pressed product, wet leaf protein cake has about 60 % moisture. The wet product can be preserved[23] or processed by two-stage drying to an acceptable textured and light coloured powder[24]. Mere acid precipitation, involving reversible denaturation, yields a product with versatility of solubilisation on pH adjustment, not possible with heat denatured material.
The desired aim of use would dictate the nature of processing. For main use as a protein supplement, the simplest and most efficient approach appears to be mixing the wet protein with starchy or other base materials before drying to get protein diluted intermediate raw materials or finished mixture or processed foods for ready use. During storage, nutritionally important pigments are lost[22], and the high levels of unsaturated lipid constituents[25] may cause impairment in protein quality and product acceptability, primarily from oxidative deterioration. Conditions for preventing such damage have to be standardised.

In case of demands for decolourised leaf protein, azeotropic solvent extraction of wet material is most efficient, but the essential problem remains of the technique and technology for getting conserved pigment concentrates. Subsequently, separation of lipids from pigments might also need attention for efficient programmes.

Pressed Residue. Under efficient pulping and pressing, about 50 % of total solids of the starting vegetation, including almost all cell wall fragments and 25 % of the original nitrogen, are retained in the pressed residue. The obvious use of this material is as fodder for ruminants. Its suitability for sheep, with the fresh wet material having a better digestibility than the dried one, has been shown[26], and also its amenability to ensiling[27].

However, more work in this area is necessary.

The implications of concentration of the crude fibre to over 40 %, with the residual nitrogen being mainly chloroplastic in origin, on the fodder value of the pressed residue have to be studied. Also, the problems in use of pressed residue from vegetations, not conventionally used as fodder, particularly the by-product greens from commercial crops, need investigations for satisfactory processing, if necessary, for removal of the undesirable constituents.

For integration into green forage dehydration industry, the 70 % or less moisture containing pressed residue of fibrous mass of ruptured cells is no doubt more efficient for processing than the 80-85 % moisture containing vegetation mass of intact cells. Further improvements in quality of pressed residue as fodder are possible by incorporating urea or ammonium salts or even by feeding back the deproteinised fluid into it. This could be done in fresh usage or during dehydration or ensiling the mixtures. Technical conditions in these directions have to be standardised for practical programmes.

Totally unexplored is the suggestion for use of the pressed residue as a base material for fermentation using fungal cultures having high cellulase and protease activity, to yield feed mixtures for non-ruminants.

Deproteinised Fluid. This fluid, separated from coagulated leaf protein, contains 1-4 % solids and must be used for the over-all efficiency of programmes and also for avoiding pollution. Since the programmes are necessarily farm-based, the simplest way of disposal would be to lead it into irrigation channels, wherever possible. It could be fed back into the pressed residue as such, as earlier suggested, or after concentration, by vacuum or other drying, to desired consistency. Standardisation of conditions for such uses is necessary.

On its possible use as medium for microbial growth, some work has been done in Sweden and Pakistan[3]. This is a relevant field for starting investigations to develop integrated techniques and technology.

CONCLUSION

This exposition focusses attention on the potentialities of increasing food production from land by a direct, integrated use of green vegetation. Research, whatever done so far around mechanical fractionation, has provided some information and technology for initiating farm-based programmes for production of fibre free protein concentrates, only extracted or extracted-cum-coagulated, for feed or supplementary food uses and the pressed residue for fodder use. Ground has been laid for developing large scale integrated technology, and leads given for further improvements around accumulating information from suggested lines of basic and applied investigations.

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'is brought in by man to plas-
p a decaying culture.'

typical example of how this rnized and rationalized religion wly but definitely encroaching politics, is a strengthening in ctivities of the Proutist Block dia. Distinctly different from lassical Jana Sangh and Hindu sabha style and having influence quite a few intelligent young the Proutists clamour for a revolution, armed if necessary, on the Vivekanandian ideals ociety based on the caste-system call it a Sad-Vipra Samaj), free either from capitalism, makes a man beggar, or com-m, which makes a man even a beast. Their battle-cry, Nam Kebalam' has been found orn many a wall in Calcutta.

ile the subtle and attractively n concept of a dreadfully void meaningless; life is being im-ed in the so-called intelligentsia, ther people are being held an prey to a more crude, but heless effective, bluntness. The on is obvious: if you are an in-ual, you go and get stuck the colourless, tasteless, odour-m of the mill world of *Ebam jit*. And if you happen to be lian deprived of the privileges sting an educated frustration, cors of *Apna Desh* are open ou to step in. Then again, if ant to get rid of the drudgeness e purposeless life, well, there on has an eager hand to help out. The scheme is thus a lete one.

this complete, well thought out calculated strategy, celluloid is means the only matter. But nt of its infinite accessibility, ilm has naturally become the ine of defence, or offence, if please. 'The cinema is for us ost important of the arts';—it us' that can make a world of nce between Lenin and Indira ni. The ruling machinery is in direct contact with this form by virtue of its 'censor' wings. This fact lends an added concrete dimension to the suspicion about some precarious designs lurking behind the technicolour, merry world of Hindi cinema.

Prima facie, it is reaction that has triumphed in the first round. It remains to be seen whether our progressive forces can muster sufficient strength to counter these trends inimical to the people, or choose to be the legendary one-eyed deer.

Indian Scientists

NARENDRA SINGH

THE suicide of Dr V. H. Shah, in Delhi, earned prominent attention in *Nature*, the reputed science weekly from London, in the form of a leading article and a reportage (*Nature*, Vol. 237, pages 130 and 134, 1972). In its commentary on issues of social and economic importance, *Nature* presents a typical approach—a cynical approach abounding in mere technological and management solutions for problems which need socio-economic and political solutions. For recent outspoken examples, one may refer to its diatribe against "A Blue-Print for Survival" under the title of "The case against hysteria" (Vol. 235, pp 63-64), and its commentary on the British miners' strike and its settlement, under the leader entitled "Setback for Mr Micawber" (Vol. 235. pp 409-410). In dealing with situations in India (or elsewhere in developing countries), *Nature* speaks from a pedestal of superior knowledge and experience, with a paternalistic and benevolent mixture of misgivings, approvals, hopes, fears and reprimands. This was again reflected in its title of "How not to run research councils (Indian style)", (Vol. 237, p. 130). A reference to *Nature* is necessary because this weekly is a fount of inspiration for, and largely reflects the opinions and aspiration of, the great majority of scientists everywhere, including Indian scientists with their heritage and continuing training in traditions of science represented in this and other journals of the clan.

Dr Shah's suicide or that of another (Dr Joseph of the same institute more than a decade back) cannot be judged, as *Nature* has done, merely in terms of the futility of sacrifice of the individual's "life in disgust so that other scientists may get proper treatment", and of hopes and fears around piecemeal reforms and adjustments, under pressure of the incidental situations. This must be viewed in the context of the continuing frustration of the Indian scientists, which is a subjective phenomenon, and more relevantly in the broad context of the frustration of science, reflecting an objective situation. The former needs to be analysed to expose the narrow, selfish aspirations of the scientific workers, and the latter for understanding the realities, to be able to use science as the effective tool for the progress of the people as a whole.

Suicide is the most extreme form of expression of disgust and helplessness in the individual's frustration, building up under pressures within oneself. Almost all scientists in India (directors, professors, senior and juniors alike) go on voicing disgust with the frustrating conditions of their work. The foreign-returned ones are invariably more vocal; they consider themselves to be of a higher order and more deserving just by virtue of their visits abroad or a foreign degree or diploma. In definition of frustration, their disgust refers mainly to the lack of free privileges for promotion, emoluments, social status and individual freedom for work and movement, though this is adorned with calls for improvements in working conditions for and in the name of

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er scientific activity, whatever it ht mean. Arguments of non-ilability of jobs are referred to but eality the will to accept any change ower remuneration, lesser security lower status, social or otherwise, altogether missing. In spite of r frustration, they remain engaged oursuits towards, and aspiring for, dfalls within the system. No oute that there is a wide disparity ong themselves, but these pro-ionals themselves are by far better in terms of social and economic vileges than the less privileged ses of peasants and workers.

The Indian scientists hail from that e and class stratum of society ch has been by tradition totally orced from direct production acti-es. Science, their professed plank activity, has not come into play as ictor for production in India from demands of the society itself. The nplex interactions of their own t traditions and the traditions of irgeois ideology with the super-posed science education, as pro-ts of European culture, give rise to lently dichotomous attitudes in n. From caste and class tradi-s, an indulgent and magnified view heir own social and material prob-s sustains their apathy and un-cern for the surrounding misery poverty of the less privileged sses, and their instilled faith in the em with over-riding respect for ial hierarchy and authority keeps m eager for favours. With their ial traditions and the profession orced from production activities, by nature go in for esoteric and eotyped pursuits, marked by an in-ectual servility for ready trans-nts from "superior" ideologies, sently of bourgeois Euorpe and erica. From the latter's cultural kground, assisted by the prevalent dominant education and commu-tions systems, the urge of indivi-lism is more readily acquired, for ious reasons. This essentially ns aspirations for individual free-to work for personal gain and/or e, to sell one's services to the est bidder, to constantly strive for one's own elitist, social and material status, the higher the better. The intensity of individualism is no doubt greater with personal experiences of life and work abroad, and even more so with the experiences in the USA, where the whole system nurtures and promotes most rampant individualism, materialism and commercialism, with full opportunities and encouragement for self-prostitution of the individual.

In privilege-ridden societies, scientists belong to and are maintained in the middle stratum of professionals mainly to serve the ruling interests. Opportunities do exist, but only for a very few of the more capable ones to rise higher, farther away from the commoners. In this process, the ability to articulately draw upon and push forth one's own professional competence in the service of the ruling interests is no doubt a great asset, the more articulate being more capable and also more hopeful to rise. In the semi-colonial societies, social heritage and relations also come into operation because of the background of long feudal traditions and of the continuing semi-feudal relations. And in these societies also operate, in cruder and more accentuated forms, corruptions, bribery and favours, which are characteristic features of all privilege-ridden societies. Since in the semi-colonial and semi-feudal societies the opportunities are invariably more limited from the growing impoverishment and widening disparity between the rich and poor, only some of those capable of the maximum social manipulations can really benefit in the rush for favours. And the most capable would be those who can be counted upon to serve best the foreign and local ruling interests. Most of the rest of the professionals of the middle stratum are bound to suffer from the continuing and growing frustrations or failures in their aspirations.

Can and would the scientists realise the fallacy of their aspirations and recognise the reality of the situation? Centres of science exist and are multiplying in the country. Scientists there work, but under continuing and growing frustrating conditions. In spite of repeated calls and incidental efforts, off and on, there have been no radical changes in the mode of functioning and activity in these centres. This situation merely points in one direction. The objectives and modes of scientific activity continue to be such that they either serve and promote the ruling interests, or do not create any obstacles in the path of these interests and hence are tolerated and maintained. So far science continues to operate for either of these purposes, the need for change does not arise. But is it the purpose of science? This raises the more fundamental issue of the continuing frustration of science in India, revolving round the question whose interests it has to serve. One may refer to Bernal's and others' essays with reference to the crisis of the early thirties in England, as an introduction to this question. This has to be dealt with separately on its own.

Book Review

Solomon's Wisdom

SINCE Richard H. Solomon is a recognised professor of political science at the University of Michigan, he acquires an unbridled right to dwell upon anything pertaining to political science in a way he considers wise, no matter whether the method adopted has any connection whatsoever with the science of politics.

The manner in which Prof Solomon studies Mao's revolution and the Chinese political culture* offers one a simple yet novel formula as a key to an understanding of any socio-political complexity. Readers of this book can learn from him that a series of interviews with 91 people,

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* Mao's Revolution and the Chinese Political Culture
By Richard H. Solomon
University of California Press, 1971
Bombay: Oxford University Press.
Price: Rs. 70/-.

Drug Problem And The UN

NARENDRA SINGH

OMETIME back the press repor- ted that the UN was backing a gramme of biological control of otic producing plants. A £60,000, e-year contract has been signed ween the UN Fund for Drug Abuse trol and the Commonwealth Ins- e for Biological Research in a ect for global control of the culti- d plants of poppy (source of m, morphine, heroin, etc) and p (source of hashish, marijuana,). The insect enemies of these nts will be sought in fields in istan, Afghanistan, Iran, Middle , Turkey, Rumania and Yugoslavia, ir feeding and breeding characters be studied in the laboratories in valpindi (Pakistan) and Delemont itzerland); and the selected ies, eventually mass-reared, will released in the fields without the wledge of the growers. It is ught that the 'illicit' growers will be able to devise safeguards be- e large-scale purchases of insec- des are very costly and their use ll get known. The UN Fund ted the contract to be kept secret, the news leaked out of Geneva use the biological, rather than the emical, approach to the problem ht particular attention.

his report raises issues of concern. reveals the ineffective manner in ch the drug problem continues to tackled, involving even the UN anisation. The attempted secrecy only exposes the one-track roach, hiding the known and un- own wider economic and other plications, but also focuses atten- on the possible surreptitious use he UN and its agencies by the re- ionary ruling forces for their own s. This makes us take a look at issues involved.

For a general picture, on must r to the U.S. scene where the blem is most acute. The latest ort reveals an increase in the num- of heroin addicts by 60 per cent over the last three years, and also the ineffectiveness of the massive enforce- ment measures which were able to seize only a small fraction of the total inflow of heroin. This is attribued to the existence of powerful well-or- ganised international rings of drug trade and traffic. Even for drugs like LSD, hashish, etc, organisations are reported to be operating in widely separated points from Canada to Australia. In several countries of Europe a distinction already exists between soft drugs (marijuana, etc.) and the hard ones (heroin, etc.). A debate has opened in the USA as well, to legalise the use of the former, a lesser evil, for a possibly more effective action against the latter. There is also proliferation of research and papers from the so-called objec- tive scientific approach, with little re- ference to the socio-political context.

Among other diversionary attempts resulting from the U.S. failure to break the hold of the powerful vested in- terests is the proposal for internatio- nal control. Reluctance of some governments to allow extradition of drug-traffickers has been played upon as a major stumbling block to effec- tive international control. One is amused at the naivete (or conscious efforts to hoodwink people) of sug- gestions that mere extradition of some 'big fish', like M. Auguste Ricord from Paraguay or Timothy Leary from Switzeralnd or someone else from somewhere else, would break the ring of the most efficient, self-perpetuating and profit-making business operating at national and international levels.

Attempts also include tackling the problem at the so-called source itself. The USA and some others have been paying large sums to some countries, where narcotic plants are grown, as compensation for banning their cul- tivation. This has failed; so they say, launch an attack; hence the UN project of control by biological means. All such efforts to solve the problem by bribery or the technolo- gical approach are bound to fail, because they ignore the basic factors. Narcotic plants for illicit trade are cultivated under economic and poli- tical pressures occurring within a country as a result of the operation of corrupt and profit-motivated ruling forces, local and foreign. And then, beyond the cultivated plants as sour- ces, the cartels of drug trade and vice have also at their disposal the means of modern science and technology for production of synthetic drugs.

Is it really possible to tackle the problem without battling against the forces which promote drug produc- tion, trade and addiction?

Reality of the Problem

A historical introduction becomes necessary to answer the questions: Who benefits from the trade? Who preys on addiction?

One of the main reasons for the rush of the new maritime capitalist powers, emerging on the seventeenth- eighteenth century European scene, to the East and the Tropics was the great attraction of profits from the drug trade. India, Indochina and Indonesia under the British, French and Dutch respectively were the first scenes of operations in this pursuit of imperialist control and capture of trade and land. Crops like opium became the chief motive even in lay- ing the much-lauded, mid-nineteenth century canal irrigation system in the Gangetic basin of North India, which disturbed the economy and led to serious damage to the fertility of

ad*. With contemporary develop-
ents, as part of the competitive as
ll as cooperative, imperialist aggres-
on and oppression, the drug scene
on emerged in China in a big way,
what is well known as the Opium
ar and its aftermath. Poisoning
th opium was the most pernicious
eans used to subjugate the Chinese
ople and to control and capture the
d, trade and economy. Those
o peddled opium at that time also
ganised and controlled the vice and
me all over the world—the analogy
ntinues into the present, with only
means, resources and the systems
operation becoming more modern.

In the affluent countries, drug ad-
tion is getting more acute, parti-
larly among the youth, as a result
the growing and induced social
d psychological pressures. An in-
resting sidelight on pressures for
ug was recently provided in a
3C-TV theme "Hypochondria, pre-
res and persuasions". The main
ints were: even outwardly healthy
ople are being made to rush in in-
easing numbers to physicians for
nquillizers; linked-up market re-
arch is now available to the drug
mpanies in the form of a computer
alysis, offering a close study of the
escribing habits of all doctors on
national register; prescribing of
ychotropics has shot up by 20 per
nt from 1965 to 1970; many doc-
rs think that the increase is due to
me alarming and illusory search for
ppiness in a capsule. Advertise-
ent, promotion of drugs, and com-
etition for greater control of market
d for more profits, are at the back
these developments. Can one
ush aside this situation, as having
relation to the drug peddling and
ug addiction? The drug and vice
gs are only better organised. And
e growing control of the whole afflu-
t socio-economic system over the
dividual's life gives rise further to
e psychological factors for falling a
prey to the induced pressures for drugs.

Thus the reality in essence is that in the developing countries the harm of opium and other narcotics is inseparable from the processes of imperialist aggression and neo-colonialist exploitation and intervention. In the affluent countries, the ruling interests of the competitive, profit-motivated system encourage peddling of drugs and organisation of vice because of the faiure to take firm and effective measures of control and also because the real social and psychological factors behind drug addiction are not attacked.

Solutions

For the developing countries, the essential prerequisite to a solution of the drug problem lies in the elimination of imperialist aggression and neo-colonialist exploitation and intervention, and achievement of complete national independence. This will ensure all-pervasive social, economic and political policies and programmes in the interest of the common people. Firm and effective measures for control of narcotic drugs go along with strengthened leadership and mobilisation of the masses, with a combination of government decrees and widespread propaganda and education. It is only in this manner that success has been achieved in a short time in China after liberation and the founding of the People's Republic.

No doubt, feasible international agreements and joint efforts on the control of narcotic drugs on the basis of respecting the sovereignty of various countries deserve serious consideration. Nationally and internationally, the narcotic drugs must be put under strict control and the illicit growing, manufacture, sale and use of such drugs prohibited, with the explicit stipulation that narcotic drugs should properly be used only in medical treatment and scientific research and that such a stipulation must be firmly put into effect. However, in the main it is up to the various countries themselves to take firm and effective measures in the light of their specific conditions and at the same time carry out extensive propaganda and education and mobilise the assistance and efforts of the people *en masse*.

The battle against the drug problem in the affluent countries also cannot succeed without firm and effective measures of control, extensive propaganda and education, and mobilisation of the people against crime and vice. To do this, the reality of social, economic and political situations would have to be faced—the reality of intensive free enterprise and rampant individualism coupled with the fast growing control that the ruthlessly competitive, profit motivated, impersonal and dehumanised cartels and corporations exert over the whole fabric (production, distribution, publicity and education) of the consumer society in its heavily industrialised, technology oriented and computerised set-up.

Bilateral, multi-lateral or international programmes in a developing country, dictated from problems or interests in an affluent country or in the developed world, always have serious implications. On one side, they form neo-colonialist intervention with serious repercussions for the people of the developing country. On the other, they constitute diversionary tactics in delaying a solution of the problem in question, by keeping the people on the wrong tracks. The well-known U.S.-Turkey agreement banning poppy cultivation is leading only to the progressive impoverishment of the Turkish farmers, with no abatement of the heroin problem in the USA. The proposed programme of biological control of narcotic plants in their homelands is just another form of neo-colonial intervention and of diversionary tactics. The usual adverse effects on the peasant economies in this case would be much more catastrophic because of the indiscriminate application of biological control. Such a programme under the prestigious umbrella of the United Nations has a much more ominous significance than neo-colonialist intervention in a developing country. The seriousness of this action is further compounded by the

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**Agrarian Condition in Northern*
dia, Vol. 1: The United Provinces
der British Rule, 1860-1900 (Uni-
rsity of California Press, 1972).

tempted secrecy on the part of the N Fund. In the words of one urnal, "the secrecy surrounding the esent project suggests that the uthorities are not taking adequate eps to investigate the likely effects f mass-releasing poppy and hemp-ea- ig insects on peasant communities". his is not the end. The mass relea- ng of insects is proposed to be done ithout the knowledge of growers, ehind the backs of the peasants the ist majority of whom engage in legal ıltivation, in accordance with the ws of the land as framed by the ling interests at a particular time. his is preposterous.

Another reprehensible aspect of this N project is the possibilities of sur- ptitious use of the research done nder the garb of the U.N. The ul- rior motives of such research may collection of intelligence for use n biological and chemical warfare ainst the patriotic armies, and in iti-insurgency operations against beration and revolutionary forces. vidence of such uses is pouring efore us both from the Indochinese eatre of U.S. aggression and from e African fields of operations of the ortuguese colonialists. Possibilities f such dangers are only growing, as ecently pointed out in a conference*. Therefore this UN proposal for iological control of cultivated narco- c plants must be opposed and con- emned on all counts. It is just an xtension of an imbecile approach to olving the drug problem in affluent ountries, using the name, organisa- ion and funds of the United Nations, body of all nations. It forms part f neo-colonialist intervention through he UN, with serious social, economic and ecological implications for the people and land in the developing countries. The attempted secrecy of the project and the proposed secre- tive control, behind the back of the growers, are preposterous and anti- people in character. Further, this research can be part of a design for collecting intelligence for use in bio- logical and chemical warfare and in anti-insurgency operations. This pro- ject is a warning about the possible, surreptitious use of simple looking re- search programmes and of the pious looking UN and other international agencies by vested interests, imperia- list aggressors and neo-colonialist exploiters.

*Papers at The International Con- erence on ABC Weapons, November 971, Berlin (organised by the World ederation of Scientific Workers); iological & Chemical Warfare, an rticle in *Frontier Weekly*, 15 April 972, Calcutta; Biological and Chemi- al Warfare, a report on the Berlin BC Conference in *Science and ulture*, March 1972.

Book Review

THE JANA SANGH: A Biography of an Indian Political Party
By Craig Baxter
Oxford University Press. Rs. 25

THE debacle of the Jana Sangh in the last Parliamentary and As- sembly elections has partly devalued Baxter's biography of the party. The Jana Sangh has ceased to be the for- midable force that it was in the Hindi heartland of India; in other parts of the country, it is virtually non- existent as before. Yet it has the distinction of being swiped at by the Prime Minister at every opportunity, possibly because she is aware that the obscurantism of the Sangh is shared by her own party to a very great extent. Her tilts at the Jana Sangh are aimed also at her party whose loyalty to secularism is as phoney as its faith in democracy and socialism. To many Congressmen the Jana Sangh is the alter ago of their party; what holds them back from imme- diate swapping is that the Jana Sangh does not have, at the moment, much to offer by way of material in- ducement. It is plain profit motive which makes Congressmen of many Jana Sanghis.

It is no secret that the late Prime Minister Lal Bahadur Shastri main- tained close relations with Guru Gol- walkar of the Rashtriya Swamsevak Sangh—much closer than what be- came the head of a secular govern- ment run by a secular party. What light he received from the revered supremo of the religious-cultural or- ganisation, which also stands for Hindu Rashtra and Akhand Bharat, is not known; but in the brief reign of Shastri, India had been twice at war with Pakistan—going by the offi- cial count, which treats the conflict at the Rann of Cutch separately. If the pains Baxter has taken to uncover how the RSS works through the Jana Sangh are brought to bear on the worthwhile task of identifying the hidden persuaders of Congressmen, some plausible explanation may be found of much that has happened in the country in the years of indepen- dence.

Baxter has collected a mass of evi- dence in support of the widely known and accepted fact that the RSS is the "ideological and organizational ancestor" of the Jana Sangh. He quotes Sri Guruji as saying that the partition of our motherlad is an abiding humiliation for us. "We have to pledge ourselves reso- lutely not to rest content un- til we have wiped out this blot". According to another Baxter quota- tion, Sardar Patel, the iron man of the Congress, said of Sri Guruji and his organization: In the Congress those who are in power feel that by virtue of authority they will be able to crush the RSS. By *danda* you cannot suppress any organisation. Moreover, *danda* is meant for thieves. ...Its use will not help much. After all, RSS men are not thieves and dacoits. They love their country. Only their trend of thought is di- verted. They are to be won over by Congressmen with love.

PUBLIKATIE 258

CHEMICAL ENGINEERING IN THE SERVICE OF MANKIND

Dr. N. SINGH

Instituut voor Bewaring en Verwerking van Landbouwprodukten
IBVL - Bornsesteeg 59 - Wageningen

Februari 1973

V O O R W O O R D

Van 3 tot 9 september 1972 werd te Parijs het Symposium gehouden over "Chemical engineering in the service of mankind".
Dit Symposium werd bijgewoond door Dr. Singh, een gastmedewerker van het IBVL.
Singh is verbonden aan het Institute for Food Technology te Mysore (India).
Hij houdt zich daar reeds ongeveer 10 jaar bezig met de isolatie van eiwit uit plantaardige bestanddelen. Alvorens deze onderzoek-opdracht in Mysore ter hand te nemen was Dr. Singh van 1959 tot 1962 onder leiding van Dr. Pirie werkzaam op het Rothamsted Experimental Station (Engeland), waar hij een dissertatie over hetzelfde onderwerp bewerkte.
Hij promoveerde in 1961 op "Factors affecting extractability and stability of leaf proteins" aan de universiteit te London.
Dr. Singh is verbonden als gastmedewerker aan het IBVL met als opdracht aan medewerkers van het IBVL de thans bestaande kennis op het gebied van de eiwitscheidingstechnologie uit plantaardige bestanddelen over te dragen.
De bedoeling hiervan is dat de medewerkers van het IBVL hierdoor mogelijk in staat worden gesteld om een bijdrage te leveren aan verbetering van de procestechniek van deze eiwitwinning. In opdracht van het IBVL woonde Dr. Singh bovengenoemd Symposium bij.
Zijn reactie op dit Symposium, zoals dat is weergegeven in bijgaand verslag, moet uiteraard voor rekening van Dr. Singh blijven. Het IBVL kan als Nederlands instituut over de door hem aan de orde gestelde politieke vragen geen uitspraak doen. De verhouding tussen de industrie en de samenleving in ontwikkelingslanden is bijv. één van deze punten. Toch achten wij het van belang dat de visie van Dr. Singh op wat ruimere schaal wordt verspreid.

Ir. P. Wiertsema, direkteur van het IBVL.

Wageningen, november 1972.

"CHEMICAL ENGINEERING IN THE SERVICE OF MANKIND"

An international congress with the above title, as an event of the European Federation of Chemical Engineers, was organised by the Société de Chimie Industrielle from 3 - 9 September 1972 at Ecole Centrale des Arts et Manufactures, Châtenay-Malabry (France). Registered participants numbered about 260 from 31 countries, including even the far ones like Argentina, Australia, Ghana, India and Nigeria. The inaugural session on 4 September tried to set the general tone for the Congress in the following manner.

Prof. H. Brauer, President of the 1973 General Assembly of the Federation, lauded the progress in making food production independent of climatic and geographical factors, and called for further efforts towards greater freedom of man from climate, geography and labour. In his inaugural address, emphasising national and regional policies, Prof. M. Kamenetzky dealt in great length with the problems of the Latin American countries. His points for that area, in general, were that the requirements were not planned to meet the local social and cultural needs, but were imposed from outside; that local organisations were not particularly national, but had links with foreign firms for profits; that there was no appropriate relation between technology and society, for example the private interests promoted cars for personal gratification and not as means of transport; and that there was imitation of the great powers. He emulated the orientations in O.E.C.D. policies to developing technologies according to social criterion and adopting technology to man and not the man to technology. He argued that if the native man was taught and given the facilities to preserve his body, he would also learn to respect others', instead of going on the path of revolution and violence. Dwelling upon technological, management and social-democratic approaches to solve the problems, he called upon the developed countries and the multinational companies to assist the developing countries. In conclusion for the chemical engineering, as against its negative aspects like napalm, etc. remaining in the forefront, he demanded strong movements towards developing and projecting a positive philosophy.

As steps in this direction, Prof. H. Brusset, President of the Congress, called upon the participants to find solutions of the problems facing the mankind. Fight against hunger, fight against pollution, and fight for protection of environment, were enunciated by him as the three tasks before them for their deliberations in the following Congress sessions.

CONGRESS DELIBERATIONS

To what extent the Congress fulfilled these tasks could be assessed only from a critical look at the deliberations. The programme covered the role of chemical engineering mainly and broadly in agriculture, food industries, medicine & biology, protection of environment and control of pollution. Let alone the physical impossibility of participating in different sessions simultaneously, but also the specialised nature of disciplines would not permit any one person to review the whole Congress in its entirety. With no presumptions, therefore, this reviewer has selected only the area of his speciality and active participations, i.e. novel sources of proteins in the section of 'Chemical engineering and aid to food industries', towards assessment of one of the tasks, fight against hunger, for proteins in particular. In the three half-day sessions on this subject, only 10 out of the 24 scheduled papers were actually presented, covering both general and technological themes.

GENERAL THEMES

The ball was set rolling in the paper dissecting the role of U.N.I.C.E.F. and the state of food technology and food industries in the developing countries. The fallacy and futility of continuing assistance on a long-term basis were exposed in serving no purpose to lasting solution of the problems. Then were given a horde of suggestions, essentially for amendments in technological and management approaches on the part of local and international agencies. During discussions, more information on the bankruptcy of international agencies was presented. Particular reference was made to the U.N.I.C.E.F. assistance to India in the form of milk and cheese processing plants, groundnut flour and protein plants, and milk-vending machines. It was pointed out that the benefits of such assistance never reached the vast majority, the supposed targets, with the products beyond their purchasing capacity, and that nor such assistance made any tangible impact on production of raw materials to increase their local availability to the common people. Attention was also drawn to the self-defeating purpose of such programmes, involving the local & foreign vested interests and working through the alienated & affluent bureaucrats and technocrats, to solve the problems of the common man.

Next paper provided information on the League for International Food Education (L.I.F.E.), established by a group of professional societies in U.S.A. as an inter-disciplinary experiment in bringing expertise of their members to bear on world food and nutrition problems.

This non-governmental, non-political and non-profit voluntary organisation had during the course of last three years also organised workshops and conferences in S.E.Asia and elsewhere in the III world, with the help of U.S.A.I.D. On the need for such a body in Europe, one participant advised, not for assistance to developing countries because of adverse implications, but only for tackling the local and regional problems by pooling expertise, particularly with reference to better use of resources and for cheap and efficient food production within the region.

A programme for manufacture of protein foods and some specific amino acids in developing countries in fight against problems of food and nutrition was outlined in a paper, with Mexico as an example. On the basis of regional techno-economic surveys and availability of raw material and other resources, details were presented for establishing in different parts of the country different protein food industries based on soybean, cottonseed, sesame, Spirulina, petroleum yeast (SCP), sugarcane molasses fermentation, synthesis of lysine and methionine, and fish protein concentrate. In the discussion, essential questions referred to the problems of heavy economic and technological investments in such industries, and those of the high costs of processed foods. For the first point, the author explained that private enterpreneurs and interests were in a big way involved in the Mexican programme, and that the problems of technology and investments were being solved by collaborations with industrial concerns from Japan, U.S.A. and other countries. Regarding the problems of costs of products, with his essential belief in the market-economy approach, the author hoped that the growth of food industries would lead to increased employment, better incomes and higher purchasing capacity, and the production of meat extenders from soybean, etc. would make cheap meat substitutes available to the common people.

TECHNOLOGICAL AND ALLIED THEMES

In a survey of leaf protein research and perspectives of technology, special attention was focussed on the problems in processing and in subsequent handling of different products for satisfactory use, viz. leaf extract, green and decolourised leaf protein concentrate, pressed fibrous residue, and the deproteinised fluid.

Instead of an obsessive attention to leaf protein in futile efforts to solve the protein hunger in the poor developing countries, the author made a plea to view it as part of programmes for efficient production of protein foods, cheap foods, and for national independence in food production. Towards use of modern techniques, mention was made of the chemical fractionation technique and of the fractional centrifugation-cum-molecular sieving procedures. To the questions on economics of processing and on the problems of chemical and microbiological hazards, attention was drawn to the assumptions based on the nature of raw materials used and of the integrated technology involved, and also to some evaluations indicating cheapness and safety. In addition, conceding the need for more systematic studies in this direction, the author also referred to the very involved and implied nature of this much misused term 'economics'. Competitive economics, in the sense commonly argued, was pointed out to be a typical feature of the purely profit motivated market societies, which also created obstacles from the competitive nature of research promoted under the influence and interplay of the local, regional and world monopoly vested interests. In elaboration was cited the example of the very wide disparity in the intensity of research & development attention between leaf protein and SCP, although former was over 4 decades old in origin and the latter not even one decade. The author concluded that objective choices and priorities for really equivalent research attention were possible even in the market societies, provided nationally independent policies were the determinants as evident in Sweden, and that the above-mentioned assumptions on cheapness and safety of leaf protein in integrated programmes could also then be satisfactorily verified.

There were two papers on fungal proteins. One reported a process for converting the sugars in carob fruit (Ceratonia siliqua) to fungal protein model, permitting an enterpreneur to estimate the quantities of various products of value in carob (trapasol, syrups, plant growth regulators) to be produced within any given region or nation. The second paper reported the development of the RHM pilot plant from original laboratory research, as the first commercial continuous in-line sterilization and fermentation production of fungal biomass from waste cheap carbohydrates. The £ 1,000,000 pilot plant was being used to provide information for design and building of production scale units in U.K. and elsewhere. Both of these British developments in very large production scales, involving heavy capital investments and highly sophisticated technology, appeared specially tuned for the developed industrialised countries.

New developments from Holland were presented on production of fish protein concentrate around the T H.E. Solvent Extraction process, including desolventisation techniques for improving the wettability of the product. Discussions on this subject revolved round various technical points.

Genetic and physiological techniques to improve the nutritive value of SCP in yeasts on petroleum hydrocarbons and development of mutant strains yielding biomass with increased methionine levels, were reported in an Yugoslav paper. Relevance of work on methionine improvements in yeast was questioned, specially by SCP experts of British Petroleum, who relegated its importance. To another quesry, the authors explained that dewaxing was a major aim in the beginning, but no longer.

Progress was reported on the two British Petroleum (BP), 4,000 and 16,000 tons capacity plants, based on paraffin and gas oil hydrocarbon processes respectively, which produced single organisms in sealed, sterile fermentation chambers under strictly controlled conditions of pH, temperature, etc. The next generation of plants was planned for 100,000 tons cap. It was revealed that although paraffin was a purer feed stock than gas oil, with the hydrocarbon source being an important cost factor in influencing the overall economies, the policies would differ in different areas. The problems involved in defining the parameters, governing adequate multi-phase mixing to give economic process conditions, and the chemical engineering approach to understanding and solving these problems were presented. However, this highly mathematical and very interesting theoretical presentation could not be scientifically discussed, because of the commercial secrecy making it impossible for the details on constants, etc. to be divulged. Questions in this direction failed to lead anywhere.

Results from studies at different centres were presented to show that the BP yeast was a good protein supplement and that it had no toxicity. Presently the use of BP product was aimed at in animal feeds, but the options were open for direct human use in diverse forms. To a question, referring to nucleic acid toxicity at kidney level, the authors disputed the observations, but conceded the need for looking into the problem. Possible dangers from carcinogenic contaminants were vehemently refuted, as also any need for using disintegration and washing techniques, on the basis of negative evidence in the BP product, allegedly from fool-proof experiments, and on that of the observed presence of such contaminants even in the commonly used food materials.

OVERVIEW

In terms of technology per se, the wide spectrum of coverage revealed very interesting developments in new processes and new sources of protein foods, ever widening the scope of production.

Fight against hunger, practically absent in the industrially developed countries, was from the start a misplaced slogan, all the more so for the wellfed and elitist participants of the Congress. Nor hunger in the poor developing countries could be solved by any contributions from the technology, management and market economy oriented experts, consciously or unconsciously, ignoring the real socio-economic and political background of the problem. However, in the affluent countries of Europe and America, food is getting costlier, specially meat. Also therein is increasing the inefficiency in food production in terms of use of land and other resources. Therefore, the slogan could appropriately have been for fight against resource misuse and for efficient and cheap food production. There was no reference to this issue at the Congress, making one wonder if the need was even recognised.

Concerned with the call for a positive philosophy for the chemical engineering, the overall trends during the Congress failed to generate any feeling of reassurance for moves towards technologies to suit man and the social criterion. Profit motivated economics and free enterprise in competitive production and market system, with all involved secrecy and promotion, were taken for granted by the expert participants. Main directions, therefore, continued to developing technologies to suit this socio-economic pattern, and to attend to social problems only as and when they arose. In the light of this, may be, one could retitle the Congress, as chemical engineering in the service of monopoly industries.

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18 September 1972;

Institute for Storage & Processing
of Agricultural Produce (I.B.V.L.),
Wageningen, The Netherlands

Dr. Narendra Singh
(on leave from Central Food
Technological Research
Institute, Mysore, India)

[T]HEMES AND SPEAKERS/AUTHORS UNDER REFERENCE IN THE REPORT
["]CHEMICAL ENGINEERING IN THE SERVICE OF MANKIND" (IBVL PUBLIKATIE 258)

[I]NAUGURAL SESSION : -

[F]ederation President's remarks : H. Brauer (Institut für Verfahrenstechnik, [B]erlin, R.D.A.).

[I]nauguration speech : M. Kamenetzky (University of Buenos-Aires, Argentina)
[C]ongres President's remarks : H. Brusset (Ecole Centrale des Arts et [M]anufactures, Chatenay Malabry, France).

[S]ECTION "CHEMICAL ENGINEERING AND AID TO FOOD INDUSTRIES" AND AREA ["]NOVEL SOURCES OF PROTEINS" : -

[L]a technologie alimentaire et l'industrialisation des pays en développement [(]Food technology and industries in developing countries) : A. Buffa (UNICEF, Neuilly sur Seine, France).

L.I.F.E. - An experiment in bringing expertise of professional society members to bear on world food and nutrition problems : L. Wingard (absent, paper presented by S.H. Chiang, University of Pittsburgh).

A suggested program for the manufacture of synthetic proteins and some specific aminoacids in developing countries, with Mexico as an example: O. Hentschel (Celanese Mexicana S.A., Mexico).

Perspectives in leaf protein technology : N. Singh (currently, Institute for Storage and Processing of Agricultural Produce, Wageningen, Nederland, on leave from Central Food Technological Research Institute, Mysore, India).

Fungal protein production from carbohydrate sources : A.J. Vlitos & F.K.E.I. Imrie (Tate and Lyle Ltd., Keston, Kent, England).

Development of the RHM (Ranks Hovis Modougall) biomass project : J.E. Munden (The Lord Rank Research Centre, High Wycombe, Buchs, Great Britain).

The T.H.E. solvent extraction process for the production of fish protein concentrate : H.A.C. Thijssen, J.Th. Oosterkamp & J.F. Hoedt (Eindhoven University, Eindhoven, Nederland).

Mutant strains of the yeast candida lipolytica 33 in gas oil dewaxing protein production : V. Johanides, V. Maric & M. Alacevic (Laboratory of Industrial Microbiology, Zagreb, Yugoslavia).

Application of chemical engineering to continuous hydrocarbon fermentation : G. Guidoboni (BP Protein Ltd., Grangemouth, Stirlingshire, U.K.).

Caractéristiques toxicologiques et nutritionnelles des levures cultivées sur alcanes (Toxicological and nutritional characteristics of yeasts grown on hydrocarbons) : E. Gatumel & C.A. Shaklady (Société Francaise des Pétroles BP, Courbevoie, France, and BP Proteins Ltd., Moorland, London, U.K.).

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nal relationships, tries to convert
: employment relationship into a
rsonal one along the lines of the
ditional feudal relationships. He
ks to make the local sarpanch or
ntractor, BDO or overseer, into
patron, hoping that he will get
oured treatment in return for his
er subservience. But he also comes
dually to grasp the meaning of
impersonal employment relation-
p, helped by his contacts with the
ban proletariat and with petty
siness. He is then in a position
become angry that he is being ex-
ited and cheated, and the poten-
l arises that he will direct his new
agonism against the coalition of
ernment officials and local tyrants.
The importance of this cannot be
restimated. The essential weak-
s of peasants has always been
ir preoccupation with economic
uggles, and their lack of awareness
the necessity to struggle for poli-
l power. But once economic
loitation and political power are
closely welded together, the pea-
t is in a position to see clearly
t it is the government which is
ploiting him economically, and
t political power is wielded by and
the benefit of his traditional ex-
iters. In this situation economic
uggle becomes, from the ouset a
scious assault on the power of the
te.

(*To be concluded*)

CORRECTION

The issue of December 23 was No. 37, not 39 as wrongly printed.

Villages Revisited

NARENDRA SINGH

DURING the last week of July 1972, an opportunity led me to visit two villages of close family ties in western U.P. with which I had practically no contact for about two had decades. The shortness of the visit and the nature of contacts were obvious limitations, but even then a cursory report might be of interest. *Village A*. (45 km west of Aligarh, situated in Bulandshahr district)

The village population of 1500-1600 is more or less equally shared among four groups, comprising Thakurs, Lodhe Rajputs, Jatavs, and one heterogeneous mixture of others like, Nai, Luhar, Julahe, Bhangi, etc. besides a sprinkling of Brahmins. Different castes form practically distinct blocks of residence, with the Thakurs, Brahmins and Lodhe Rajputs in a sort of contiguous section. New constructions in the village belong to a few retired government servants and to Lodhe Rajputs, who have improved their status from agriculture. The village has no electricity.

Jatavs form the mass of landless community in the village, earning about Rs 3 per day during the season. Some of the fortunate among them are on regular employment with the landlords at Rs 900 a year, along with some paltry traditional benefits. Among the Thakurs are all landlords and some rich peasants, while almost all Lodhe Rajputs are peasants, rich and poor. In gram sabha and other organisations, the Thakurs dominate.

The agriculturally rich land has been traditionally under tubewell irrigation. From the original one or two government tubewells about two decades back, the number has gone up by another 17 private ones. Of them only one belongs to a Jatav, two to Lodhe Rajputs, two to Brahmins, and the rest to Thakurs. Tubewell owners earn extra income from sale of irrigation water. Electricity is reported to be irregular in supply, and subject to favours from bribed operators.

In the past, sugarcane and ghee had the main economic importance in the area, the other crops being wheat, mustard and pulses, including arhar. In 1971-72, a typical rotation in one landlord's fields, with adequate fertilizers and irrigation, was maize-rape-wheat. Apparently, the high yielding cereals have relegated sugarcane to secondary economic importance. For seeds to be purchased fresh every season, there is now an imposed dependence on outside centres and sources. Arhar has altogether vanished from the scene, causing serious shortage of common household fuel. With the establishment of the Glaxo Factory in Aligarh, collecting milk from all round, ghee is no more locally produced as a commodity, with the result that matha (butter-milk), a common protein-rich home fluid, is no more available for the children, guests and others, as it used to be in the past. *Village B* (25 km east of Aligarh district town).

The village has a population of about 2000, with about 800 Thakurs, 200 Brahmins, 400 Jatavs, and the rest comprising Dhobi, Luhar, Teli, Gadaria, Kuhar, Bhangi, etc. Thakurs form a contiguous block of residence extending to one side of the village, where landlords are mostly concentrated. Brahmins are sprinkled here and there in this block. Jatavs live in two blocks within the village and the Bhangis in two hamlets close by. The obviously new constructions are on behalf of Thakurs, employed in different types of jobs outside. Some of them are planning to settle in the nearby town, but almost all of them have sustained land interest in the village, presently as absentee landlords. There is no electricity in the village.

The landless labour community is

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...ed of Jatavs and other 'low' ... Thirty to forty per cent of ...hakurs are landlords. Tradi..., the land has been canal irri... agriculturally poor and with ...usar patches. Some improve...ppears to have resulted from ...nsolidation and installation of ...ubewells. All of the existing ...ls and those planned for the ...ture belong to Thakurs. Per...heel is still a common sight. ...peasants have emerged as a ... with some impoverishment of ...dlords staying in the village.

...striking development has been ...ergence of a school, recently ...ded to High School. About ...cades back, there was only one primary school. In the five classes of the High School, from Class VI to X, there are 150 students, most of them from Thakur families with less than 5% from the Jatavs and other 'low' castes. Almost all of the ten teachers are untrained and on remuneration less than that prescribed by the government. The school as well as other public bodies are under the dominance of the Thakurs. Gram-Utthan Sangh, a sort of youth organisation for village uplift, has its active membership from the Thakur landlord families, having leisure for such activities. The leadership has some association with the Communist Party of India.

A New Opposition : Student Power

BHARTI AZAD

...E emerging student revolt in ...different States must be consi...in its totality,—in its present ...cal setting—not as an isolated ...menon in the Indian social life. ...tionalized education has given ...to new social groupings. It is ...sible to integrate these groupings ...he developing capitalism system in ...

...e apologists of the system are ...g that the student revolt is be...e of the lack of necessary material ...ties in the colleges and univer...ties, lack of 'proper' education and ...dance' to teach the young 'how ...ehave'. Among these are many ur...te pseudo-progressives who think ...trouble is the making of rough, ...and uncivilized frustrated young .... The reformists of the status ...recommend the instant solution ...single problem—unemployment. ...feel that youth is frustrated, hence ...evolt. The kept reformists of the ...blishment suggest university re...ns, which they think is a gradual ...nge-process. When the students ...sciously or unconsciously turn ...r backs on such reforms of bourgeois education, they are accused of rejecting 'dialogue'.

The developing capitalism in certain pockets, the decaying feudalism in other regions, and the dualism of rural and urban life, confront the Indian youth with insoluble contradictions, not only in the educational institutions or at their working places, but also in the money-controlled economy and bourgeois society. The emerging student revolt represents, on a much broader social and historical scale, the contradictions in the bourgeois State-directed transformation of the productive forces and consequently disturbed social relations.

The contradictions between intellectual and manual labour are still developing in India. The present student revolt is not because of this realization and also not because labour—intellectual or manual—is not available. The revolt is not yet that mature to represent the historical condition which Marx foresaw in his *Grundrisse* (Outlines of a Critique of Political Economy): "the reintegration of intellectual labour into productive labour, men's intellectual capacities becoming the prime productive force, in society." In the present phase of the developing capitalism in India, there are occurring profound changes in intellectual employment. The majority of university products (graduates) cannot become high-up bureaucrats or professionals or even direct agents of high-ups with strictly supervisory functions, but white-collar employees of the State or industry, and thus part of the great mass of salaried workers.

The student milieu has a specific character as a special social stratum, with which students from different socio-economic groups often assimilate, breaking their ties with their family environment without yet being integrated into the social environment of their professions-to-be. Among this section of the youth, there is an unwillingness to understand or accept a fundamental objective fact—that man's chief productive force will be his creative, intellectual power. In the emerging Indian capitalist society this intellectual power is only potentially productive today, because the system beats it down and stamps it out as pitilessly as it beats down the personality and creative impulse of the manual workers.

All students, particularly those living away from their homes, are partially and temporarily 'declasses', existing in a limbo between their wealthy or working class past and whatever careers or jobs they are being channeled into. Students are denied even bourgeois democratic rights. As neither workers nor owners, living under coercive rules without even the illusion of having chosen the authority over them, students share some of the experiences of the more clearly classless elements of society—the true lumpen proletariat. This experience has at least some effect on their consciousness. Their class loyalties weaken. Of course they are still largely products of their natal class. But because their class position is now ambiguous, many of them may slip out of the class roles for which they are supposedly being trained.

There is at the base of student re-

an anti-Sarat Sinha line. But, a little guidance from New i, Mr Sinha has neatly got the r of them with a flanknig move-. Over large areas, again, the assumed a religious communal acter, with immigrant Muslims have accepted Assamese) and lu refugees (who have not) ing it out. Anger and panic, ety and incitement certainly led trocities, though some Calcutta rs (one called Kamrup, a big ict, a town) depended largely imagination to furnish details. Assamese students were brutal-nurdered by desperate mobs. gali deaths number at least n, though it is not considered er to express sympathy for them. sides were armed with lethal pons, though this seems to be first introduction to such con-tions as acid bulbs for Assamese -social elements.

he political parties somewhat be-dly condemned the riots. They n to have been taken by surprise the riots, probably made less t by sincere professions of peace-intentions. But they did not par-pate in the movement, to the ignation of those who did. (Of rse some parties could not con-l their members). The CPI and RCPI leaders did not fare well h crowds that demanded greater itancy. In the end, eight political ties, including even the Congress l the CPI, issued an appeal for ace and patient discussion that l a sobering effect. But most of m lack a mass base and willy-ly have to tail the middle class ich has acquired a taste and flair direct agitation over certain ngs. This time minority organi-ions like the PTC and the URP de-nded the rights of the Bengali nmunity, but outside their follow-they do not have much influence.

The decision of the Supreme Court y well accelerate the plans to arate Cachar. Already certain tions of the population are cal with this demand for aration of Cachar, while the people of Cachar themselves do not want it. If it is done, the chauvinists of both the camps will be triumphant. It is a disturbing thought that this may serve as a precedent for further dismemberment of Assam, as communities deprived of scarce resources seek territorial solutions of a problem created by capitalism in a backward country. Indeed the Central administration may consider such units, small and weak, easier to handle, or to pit against each other. Already, boundary disputes between some of them have acquired the character of small-scale wars.

At this moment, however, the Centre is profiting most from the situation. Will a pattern emerge in near future of creating such demands, getting people agitated over them, and finally stepping in gracefully to fulfil those demands? Thus Assamese chauvinism is unwittingly playing into the hands of the Centre. The initiative is still very much with the bourgeoisie who choose their moments and the places before striking. We have failed as yet to build up an extensive organization for launching any effective popular democratic movement, directed against the real enemies of the people.

Finally, what about the CIA? I am sure they are active, but it is only fair to report that certain intellectuals, radio artistes and journalists consider me one of its busiest agents. I have never doubted their sagacity.

October 27, 1972

Green Revolution Not So New

NARENDRA SINGH

THE Indian 'green revolution' is lauded and played up by the local leaders and experts as well as by others as a solution of the food problem and a promise for the country's economic progress and rapid development. But where does it lead to in reality? In the context of imperialism and monopoly capitalism, the economic and political implications of local policies, subservient to foreign interests, are bound to be against the interest of the nation. On the native physical and social ecology, the impact of objectives and techniques transplanted from countries of Europe and America cannot but be adverse.

Historically, 'green revolution' is not altogether a novel innovation in India. In its background, mood, objectives and approaches, something similar was attempted one hundred years ago, as is evident from a recent publication compiled from the India Office Library and Records (*Agrarian Conditions in Northern India*, Vol. I, *The United Province under British Rule, 1860-1900*, by Elizabeth Whitcombe, University of California Press, 1972). Reading it, one just cannot but feel that history is being repeated. To begin with, the author depicts the mood of the authorities in the 1860s, after transfer of power from the East India Company to the British Crown, as follows: "In their awareness meanwhile of great temporal power and from a conviction of the rightness of *Britain's* self-appointed role to create a model amongst the *Empire* spokesmen of the *Crown* Government stressed the responsibility inherent in the task of enlarging upon its inheritance not to supplant the existing social order, but to shepherd it firmly to modernity" (p. ix, emphasis ours). Substitute the three emphasised words by New Congress, the Third World and Indira, and the professions of present-day rulers would be clear.

The dominant aim of the enterprise under the Crown was to stimulate the lagging productivity of traditional agriculture within the shortest space of time and in areas where investment necessary to achieve this

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might be assured of a generous vell as rapid return, and it was ned with confidence that the ety would inevitably share in the efits that modernisation implied. ceforth, routine administration geared to modernisation, in ac-lance with the contemporary tern principles; elements of in-ation, technical and others, were inguishable from the environ-it into which they were introduc-by their definably foreign origin n origin known in detail from temporary literature on engineer-techniques and the political and il institutions of the nineteenth-tury Britain; new economic ins-itions and incentives were grafted o an intricate pattern of old, al relationships, once flexible but, mid-nineteenth century, increas-ly subject to constriction. Thus s enforced the transplant of tech-al, economic and political ap-oaches of the West by the British perts at that time.

No different are the aims, objec-es and approaches behind the een revolution' of today, being im-anted under inspiration from and novations by 'international' experts om the West, predominantly of e USA, sponsored by world mono-ly interests. The only difference that the present programmes are ing implemented with the blessings f the native rulers by the local ex-erts, the native elites trained in and lolising the Western model of eco-omic, technological and political evelopment.

The capitalist West essentially imed at promotion of commodity-riented agriculture. As a result, he sudden and uneven stimulus ad-ninistered to the local agriculture n India, in the 1860s and later, led o the creation of cases of good soil, vell watered and attended by bene-its of the optimum in natural re-ources allied with the maximum in rofitable new lines of cultivation. Highly selective crop increases oc-urred: Wheat, increasingly impor-ant as an export staple from the nid-1970s, benefited consistently, as did other 'valuable' crops, notably cotton and sugarcane, indigo and opium, the latter ones introduced for large-scale cultivation under the new impetuses and incentives; millets and pulses, on which the overwhelming majority of the population depended for food and fodder, were not adopted for artificial irrigation; pastures and 'waste' lands with less and less animal products and fire-wood also declined. As is well known, indigo was eliminated with the discovery of synthetic dye bases, opium moved out to China, cotton got shifted to the rich black soils in the south, and wheat remained the main export crop of northern India until displaced by American wheat in world trade and commerce.

How similar is the pattern of developments under the present 'green revolution', with promotion of selected crops in package programmes in selected areas of optimum natural resources and under intensive artificial inputs for maximum returns! High-yielding strains have made wheat again the man cash crop, relegating even sugarcane to second place; new crops, like soyabean, etc. are being introduced to promote demands for new products and new technology; common pulses, not fitting in the new commodity-oriented agricultural pattern, are again getting displaced, causing shortage of cheap and simple protein foods and also of household fuel, as that from *arhar*; the urban supply schemes and processing centres have even made milk a cash commodity, displacing local production of *ghee*, with the result that even the former cheap and nutritious butter-milk (*matha*) is no more commonly available in village homes. In today's world, the follow-up of such developments, dictated by the dominant monopoly interests, could only follow a more subservient pattern than that in the last century.

Impact on Ecology

The impact of the then new trends in agriculture (1860-1900) on the ecology of the land was all the more disturbing. The burden on land through persistent heavy cropping for the 'valuable' produce led to deterioration in fertility, which was further aggravated by the decrease in organic manure from animals whose numbers declined because of the narrowing of pastures and more particularly because wells were displaced by canals for irrigation. Most serious of all, however, was the effect on the delicate mechanism or the hydrological cycle. Deforestation, obstruction of natural drainage by public work embankments of roads and railways, together with later seepage and flush irrigation from canals sharpened the natural tendencies towards accumulation of toxic quantities of alkali salts in the upper layers of the soil over vast areas of low-lying tracts in northern India. Everybody is familiar with numerous, vast alkali (*usar*) patches, as white scabs on the face of the land there, which are in the main the consequences of the totally profit-motivated agricultural policy of the last century for maximum returns in the shortest possible time, with no concern at all

...nediate or long-term harm to ...al ecological environment.

... too early for the ecological ...tions of the modern 'greent ...on' to manifest themselves, ...e generic factors are there in ...ensive inputs of chemical fer... irrigation, pesticides, and of ...nisation, in intensive produc... ...cles of 'valuable' crops out of ...ith the evolved and establish... ...tional practices, and in cul... ...n of mono-culture species and ... results not of natural evolu... ...nd selection but of induced ...on and genetic manipulations. ...for social ecology at that time, ... found that every innovation ...evelopment (expansion of agri... ...e, flourishing trade in agri... ...al products, scientific principles ...venue assessment and inflexibi... ...f their operation in practice, ...made demands on existing insti... ...s far out of proportion to their ...ity. The inevitable dislocation ... followed, at each stage, in the ...cal and social environment ...l not be remedied in consonance ... the immediate interests of the ...rnment, which depended heavily ...he maintenance of the status ... however distorted it might have ...me. For example, a logical work... ...of new laws could have led to ...opriation of the zamindari and ...ddari classes and a revolutionary, ...al change, but compromise saw ...t that a system of legal reliefs ... alongside the debt and aliena... ...laws to rescue the indebted pro...tor; only a depressed peasantry ...left labouring in a distorted ...ronment. How does it compare ... the present? The ruling party ... the Government, since the trans... ...of political administration from the ...ish, have continuously been com... ...ed by situations and pressures, ...and new, to voice radical slogans. ... 'green revolution' only creates ...her pressures, and more vocifer... ... than in the past have been the ...ent slogans and professed moves ...land reforms and changes in land ...tions, prompted by the advice of ...ral-radical and radical-liberal experts. But compromises continue, because the feudal and semi-feudal interests remain dominant on the socio-economic and political scene. Only the vast majority of the rural population suffer and get more and more impoverished.

However, the stimulated expansion of agriculture and flourishing trade in agricultural products in the nineteenth century, motivated and promoted by the colonial interests through their representatives in India, could not go on unabated. Not so promising were the results of transplant of innovations and the commodity approach, foreign in origin, on the native agriculture of characteristically different physical and social ecology, alongside an administration incapable of giving assurances. This soon turned the entrepreneurs of world trade in wheat to larger and less encumbered sources in America. Their old and inefficient suppliers in India were left to exploit the local distorted ecological and economic environment in ways to which the stimulus to increase had led them. Such a development would have made greater impact under the present 'green revolution', when the Indian comprador bourgeoisie, subserving the much stronger world monopoly interests, forms the other section of local vested interests dominating the socio-economic and political scene.

Attention must be drawn to a significant point, generally missed in analyses. During the colonial period, India happened to be that large country where the department of agriculture and later even the expanding education in agriculture—the mainstay of the vast majority of the people—used a foreign language not at all intelligible to the common man of the area; and the foreign agricultural experts, and later also the native ones, all along remained alien to the village folk. The situation in modern India in this repect has not changed from what it was in the last century. This is not surprising. After all, there is an obvious similarity in basic philosophy and approach behind the efforts at 'agricultural modernisation' in the two periods: attempted promotion of (capitalist) agriculture around commodity production, based on intensive inputs and investment for quick and maximum profits under technical assistance of an alienated class of privilege-seeking professionals, wholely unconcerned with the physical, social, economic and political implications for the native society in general and the common people in particular, and under overall manoeuvring dictates of imperialist and monopoly interests of the world.

In the late nineteenth century the social environment had undergone sufficient distortion and a social upheaval would have been inevitable, provided there had emerged a strong national bourgeoisie capable of overthrowing the ruling forces of imperialists and their native feudal allies. In other words, objective conditions for a profound social change were there, but the subjective forces capable of leading such a change were missing and it was not for the imperialists to assist a process only for self-destruction. This is a fact of history. Today also the objective conditions for revolution are there in different parts of India. But a social-democratic leadership, serving the interests of the feudal and comprador bourgeoisie, cannot lead such a revolution. Nor can a combine of social democrats, bureaucrats and technocrats of the privileged classes readily assist a process which would only take away their own privileges. Such a task can be performed only under the leadership of revolutionary forces of peasants and workers, in alliance with other sections of the society struggling for democracy and freedom. In contrast with the last century, the necessary subjective forces capable of taking advantage of the objective conditions for revolution have emerged. The agricultural history of the last century is not to be repeated in its total sequence now. This is the brightest feature of the present.

ker Narendra Singh is in de Engelse taal gesteld. Mevrouw Singh is echter zo vriendelijk geweest hiervan een Nederlandse versie te vervaardigen, die ook in dit nummer is opgenomen. Vanaf deze plaats hartelijk dank aan Mevr. Singh, omdat zij de bijdrage van haar echtgenoot voor alle ibvl-ers toegankelijk heeft willen maken.

JHWvdS

REORGANISATION OF IBVL - SOME THOUGHTS

Director Wiertsema's introduction of possible reorganisation of the IBVL has fermented discussions of the issue among the IBVL colleagues. Groenvoeder Afdeling coworkers have raised several questions and points in their 'Open Brief'. This is merely a supplement:

Discussions are necessary both on the basic issues in the background and on the consequences of a reorganisation in operation, particularly in its effects on the personnel. Quite a few points pertaining to the latter have been rightly brought out in the 'Open Brief'. With no intention to go into that area, the main emphasis in the following is on the basic question:

Why a need for reorganisation?

This question, in being raised, has two significant aspects. One reflects the basic urge for democracy, for democratic participation in decision making processes and for democratic decisions, on the part of those people who are to bear the responsibility to execute the decisions in practice, who are going to be affected by changes in the operation system, and whose actions have much wider implications for the society, in general. No one could question the need for supporting, promoting,

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veer round, and must be made to veer round, to have a positive view and to give a posit[illegible] response to this urge and development , beginning with an open and thorough discussion of the current issue.

The second aspect of the question is more fundamental in referring to the whole purpos[illegible] of the IBVL organisation and activity. Answe[illegible] from the management and others to this quest[illegible] would be illuminating. However, one may vent[illegible] in presenting some thoughts aloud to provoke discussions and orientations, hopefully into fruitful directions.

The Context and the Future

As must be clear, the IBVL does not present [illegible] picture in isolation from the general trends operating on the Dutch national scene, or ev[illegible] beyond in all industrialised countries, gear[illegible] to market economies. Science budgets are bei[illegible] axed everywhere and the demands are being ma[illegible] for more purposeful or applied research or, [illegible] essence, for a returns-on-investment oriente[illegible] research. This trend is aptly described as a natural corollary from the former laissez-fa[illegible] in science leading to the present laissez-innover under the operating socio-economic demands. Essentially it means that the contemporary decision makers operate as a result of, and the decisions result from, competitiv[illegible] pressures, economic and others. Science is merely used as a tool in furtherance of the aims of the dominant pay-masters directly or through the governmental and other agencies. Under such a situation, wider social interest[illegible] or long-term consequences of the decisions are invariably ignored to subserve the most dominant vested interests.

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by well organised and concerted research activity in its specialised field of storage and processing of agricultural produce. An analysis of the policies and programmes would reveal that the major emphasis so far has been on ~~XXX~~ problems, arising in the current pursuits of growers and processors of agricultural produce. With the agriculture going down in relative importance, and allowed to do so under the operating socio-economic pressures, the scope of research in agricultural produce evidently narrows down. The constricting areas of activity would have increasingly greater involvement mainly for wider markets, which is not necessarily promotion of the Dutch agriculture. Under such trends, the suggested reorganisation for research on paid commissions ('betaalde opdrachten') is the natural corollary. In such an approach, not only research of apparently long-term value has to be sacrificed, but the organisation, activity and personnel must be prepared to submit to progressively constricting pressures. Beside the growing spectro of unemployment for the personnel, even the institute may end ultimately into, if not redundancy and closure, a training centre for employment and assistance abroad.

Instead of being subject to constant adjustments to demands from such pressures, a positive alternative appears to be reemphasising and reorienting the policies and programmes around a long-term approach to the Dutch agriculture to sustain it, to promote it and to strengthen it by projections and perspectives. This must involve an integrated approach of a judicious combination of research on the current problems of growers and processors with that on long-term projects of real value in promoting Dutch agriculture.

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commissions, necessary pressures have to be created on the government by joining forces with those on the national scene who are really interested in the Dutch agriculture and society. However, for any move in this directio one has of course to self-answer the question: Whether there is any need for all this or one is satisfied to safeguard one's own interests for one's own life time?

Wageningen, 30 november 1972

Narendra Singh

DE NEDERLANDSE VERTALING LUIDT ALS VOLGT:

REORGANISATIE VAN HET IBVL - ENKELE GEDACHTEN

DE DOOR DIREKTEUR WIERTSEMA GEHOUDEN INLEIDING OVER MOGELIJKE REORGANISATIE VAN HET IBVL HEEFT ONDER DE IBVL-KOLLEGA'S DISKUSSIES OVER DIT ONDERWERP OP GANG GEBRACHT. DE MEDEWERKERS VAN DE AFDELING GROENVOEDERS HEBBEN IN HUN 'OPEN BRIEF' VERSCHILLENDE VRAGEN GESTELD EN PUNTEN NAAR VOREN GEBRACHT. DIT STUKJE DIENT SLECHTS ALS AANVULLING.

DISKUSSIES, ZOWEL OVER DE FUNDAMENTELE PUNTEN DIE AAN DE REORGANISATIE TEN GRONDSLAG LIGGEN, ALS OVER DE GEVOLGEN VAN EEN EENMAAL AAN DE GANG ZIJNDE REORGANISATIE, IN HET BIJZONDER DIE VOOR HET PERSONEEL, ZIJN NOODZAKELIJK.

EEN AANTAL PUNTEN DIE BETREKKING HEBBEN OP LAATSTGENOEMDE GEVOLGEN ZIJN VOLDOENDE NAAR VOREN GEBRACHT IN DE 'OPEN BRIEF'. IN HET NU VOLGENDE ZAL DAAROM DE NADRUK LIGGEN OP DE FUNDAMENTELE VRAAG:

WAAROM IS ER BEHOEFTE AAN REORGANISATIE?

HET STELLEN VAN DEZE VRAAG HEEFT TWEE BELANGRIJKE ASPEKTEN. HET ENE ASPEKT TOONT DE FUNDAMENTELE BEHOEFTE AAN DEMOKRATIE, MET NAME DEMOKRATISCHE DEELNAME AAN BESLUITVORMING EN AAN DEMOKRATISCHE BESLUITEN, BIJ AL DEGENEN DIE DE VERANTWOORDELIJKHEID ZULLEN DRAGEN BIJ HET UITVOEREN VAN DE BESLUITEN EN DE INVLOED ZULLEN ONDERVINDEN VAN DE VERANDERINGEN IN HET WERKPATROON, EN WIER AKTIVITEITEN GROTE GEVOLGEN HEBBEN VOOR DE MAATSCHAPPIJ IN HET ALGEMEEN. NIEMAND ZAL DE NOODZAAK IN TWIJFEL KUNNEN TREKKEN VAN HET STEUNEN, STIMULEREN, VERSTERKEN EN OP DE JUISTE WIJZE OPBOUWEN VAN ZULK EEN DEMOKRATISCHE BEHOEFTE. DE AUTORITEITEN MOETEN (ZO NODIG ONDER DWANG) EEN ZWENKING MAKEN TENEINDE ZICH POSITIEF OP TE STELLEN TEGENOVER, EN POSITIEF TE REAGEREN OP, DEZE BEHOEFTE EN ONTWIKKELING DOOR EEN OPEN EN DIEPGAANDE DISKUSSIE OVER DIT ONDERWERP TE BEGINNEN.

HET TWEEDE ASPEKT VAN DE VRAAGSTELLING IS VAN MEER FUNDAMENTELE AARD, DAAR HET BETREKKING HEEFT OP DE GEHELE DOELSTELLING VAN DE IBVL-ORGANISATIE EN DE AKTIVITEITEN VAN HET INSTITUUT. ANTWOORDEN VAN DE LEIDING EN ANDEREN OP DEZE VRAAG ZOUDEN HIEROP LICHT KUNNEN WERPEN. MEN ZOU HET EVENWEL KUNNEN WAGEN REEDS ENKELE GEDACHTEN OVER DEZE KWESTIE UIT TE SPREKEN MET HET DOEL DISKUSSIE UIT TE LOKKEN EN EEN OPSTELLING IN DE JUISTE RICHTING TOT STAND TE BRENGEN.

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HET VERBAND EN DE TOEKOMST

HET ZAL DUIDELIJK ZIJN DAT HET IBVL NIET EEN BEELD VERTOONT DAT LOS STAAT VAN DE ALGEMENE TENDENZEN DIE AANWEZIG ZIJN OP NATIONAAL NIVEAU IN NEDERLAND OF ZELFS DAARBUITEN, IN ALLE GEÏNDUSTRIALISEERDE LANDEN MET EEN HANDELEKONOMIE ('MARKET ECONOMY'). OVERAL WORDT BESNOEID OP DE GELDMIDDELEN VOOR DE WETENSCHAP EN ER IS EEN VRAAG NAAR MEER DOELGERICHT OF TOEGEPAST ONDERZOEK OF, IN WEZEN, OP ONDERZOEK DAT OP KORTE TERMIJN BATEN AFWERPT. HET IS JUIST TE STELLEN DAT DEZE TENDENS NATUURLIJKERWIJS VOORTVLOEIT UIT DE VROEGERE HOUDING TEN AANZIEN VAN DE WETENSCHAP, AANGEDUID ALS HET 'LAISSEZ-FAIRE', WELKE LEIDDE TOT HET 'LAISSEZ-INNOVER' ONDER INVLOED VAN DE VAN KRACHT ZIJNDE SOCIO-EKONOMISCHE EISEN. IN WEZEN BETEKENT DIT DAT DEGENEN DIE THANS BESLISSINGEN TOT STAND BRENGEN, HANDELEN ALS GEVOLG VAN, EN DAT DE BESLUITEN TOT STAND KOMEN DOOR, KONKURRENTIEDRUK VAN EKONOMISCHE EN ANDERE AARD. WETENSCHAP WORDT LOUTER GEBRUIKT ALS INSTRUMENT TER BEVORDERING VAN DE OOGMERKEN VAN DE INVLOEDRIJKE BETAALMEESTERS, HETZIJ DIREKT, HETZIJ INDIREKT VIA REGERINGSINSTANTIES OF ANDERE ORGANISATIES. IN ZO'N SITUATIE WORDT NOOIT REKENING GEHOUDEN MET DE RUIMERE SOCIALE BELANGEN OF MET DE GEVOLGEN VAN DE BESLUITEN OP DE LANGE DUUR, MAAR UITSLUITEND DE MEEST DOMINERENDE, GEVESTIGDE BELANGEN WORDEN GEDIEND.

HET VOORNAAMSTE DOEL VAN HET IBVL, ZOALS DE NAAM AAHGEEFT, IS HET BEVORDEREN VAN DE NEDERLANDSE LANDBOUW DOOR GOED GEORGANISEERD EN GEZAMENLIJK ONDERZOEK IN HET GESPECIALISEERDE GEBIED VAN BEWAREN EN VERWERKEN VAN LANDBOUWPRODUKTEN. EEN ANALYSE VAN HET BELEID EN HET PROGRAMMA BRENGT AAN HET LICHT DAT DE MEESTE NADRUK TOT DUSVER IS GELEGD OP DE PROBLEMEN DIE RIJZEN IN HET HUIDIGE WERK VAN LANDBOUWERS EN VERWERKERS VAN LANDBOUWPRODUKTEN.

MET HET AFNEMEN VAN DE RELATIEVE BELANGRIJKHEID VAN DE LANDBOUW, WELKE AFNAME WORDT TOEGELATEN ONDER DE VAN KRACHT ZIJNDE SOCIO-EKONOMISCHE DRUK, WORDT HET ONDERZOEKGEBIED IN LANDBOUWPRODUKTEN DUIDELIJK BEPERKTER. DE INGEKROMPEN AKTIVITEITSGEBIEDEN ZULLEN STEEDS MEER GERICHT WORDEN OP RUIMERE AFZETGEBIEDEN, WELKE GERICHTHEID NIET NOODZAKELIJKERWIJS DE BEVORDERING VAN DE NEDERLANDSE LANDBOUW INHOUDT. UIT DERGELIJKE TENDENZEN VLOEIT NATUURLIJKERWIJS DE VOORGESTELDE REORGANISATIE IN DE RICHTING VAN ONDERZOEK OP BASIS VAN BETAALDE OPDRACHTEN VOORT. BIJ EEN DERGELIJKE BENADERING WORDT NIET ALLEEN ONDERZOEK DAT OP DE LANGE DUUR VAN WAARDE KAN ZIJN, OPGEOFFERD, MAAR OOK MOETEN ORGANISATIE, AKTIVITEITEN EN PERSONEEL BEREID ZIJN ZICH TE ONDERWERPEN AAN DE STEEDS MEER BEPERKENDE DRUK. NAAST HET GROEIENDE BEELD VAN WERKLOOSHEID VOOR HET PERSONEEL, ZAL HET IBVL ALS ZODANIG TENSLOTTE ZELFS HET BEELD VERTONEN VAN EEN INSTITUUT DAT, ZO AL NIET OVERTOLLIG EN OP PUNT VAN SLUITING ZIJNDE, ALLEEN NOG OPLEIDT VOOR TEWERKSTELLING IN EN HULP AAN HET BUITENLAND.

IN PLAATS VAN VOORTDUREND ONDERWORPEN TE WORDEN AAN AANPASSINGEN AAN DERGELIJKE OPGELEGDE EISEN, LIJKT HET EEN ZINVOL ALTERNATIEF OM HET BELEID EN DE PROGRAMMA'S TE HERZIEN EN ANDERS TE BENADRUKKEN, UITGAANDE VAN EEN PLANNING OP LANGE DUUR VOOR DE NEDERLANDSE LANDBOUW, WAARBIJ DEZE LAATSTE GESTEUND, BEVORDERD EN VERSTERKT WORDT DOOR VISIE EN INZICHT.
DIT MOET INHOUDEN EEN HARMONIEUZE, OORDEELKUNDIGE KOMBINATIE VAN WERK AAN HUIDIGE PROBLEMEN VAN LANDBOUWERS EN VERWERKERS MET DAT AAN PROJEKTEN DIE OP DE LANGE DUUR VAN WERKELIJKE WAARDE ZULLEN BLIJKEN TE ZIJN VOOR HET BEVORDEREN VAN DE NEDERLANDSE LANDBOUW. VOOR DE LAATSTE KATEGORIE WERK, DIE NIET BEKOSTIGD ZAL WORDEN VIA BETAALDE OPDRACHTEN, MOET NOODZAKELIJKERWIJS DRUK WORDEN UITGEOEFEND OP DE REGERING DOORDAT MEN ZICH VERENIGT MET AL DIEGENEN IN NEDERLAND DIE WERKELIJK GEÏNTERESSEERD ZIJN IN DE NEDERLANDSE LANDBOUW EN MAATSCHAPPIJ. ECHTER, VOOR IEDERE STAP IN DEZE RICHTING MOET MEN VOOR ZICHZELF DE VRAAG BEANTWOORDEN: IS ER AAN IETS DERGELIJKS BEHOEFTE?, OF IS MEN ERMEE TEVREDEN ZIJN EIGEN BELANGEN VEILIG TE STELLEN VOOR DE DUUR VAN ZIJN EIGEN LEVEN?

WAGENINGEN,
30.11.1972 W.G. NARENDRA SINGH

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MIJ DUNKT GENOEG STOF VOOR DE IBVL-MEDEWERKERS OM TE OVERDENKEN EN BIJ DE MENINGSVORMING VAN INVLOED TE LATEN ZIJN; BOVENDIEN GENOEG STOF VOOR DE DIREKTEUR OM IN IEDER GEVAL EEN GROOT GEDEELTE VAN ZIJN TRADITIONELE NIEUWJAARSTOESPRAAK TE WIJDEN AAN DIT ONDERWERP.

IN DE JANUARI-EDITIE ZAL ER ONGETWIJFELD AAN DEZE ZAAK WEDEROM AANDACHT WORDEN BESTEED.
UW KOPIJ IS WELKOM.

JHWVDS

Persoonlijk ben ik van mening dat een kommissie - of kontaktraad - op vrijwillige basis eerder een bepaalde vertrouwenssfeer tussen direktie en kommissie (en dus personeel) zal kunnen scheppen dan een officiële "dienstkommissie". Ik heb geen enkele behoefte aan rechtstreekse bindingen met wat hier in Nederland "vakbonden" worden genoemd. Zuiver theoretisch zijn er waarschijnlijk argumenten pro officiële dienstkommissie bij de vleet. Neem alleen het feit dat een officiële dienstkommissie vanwege zijn bond-bindingen eigenlijk een onderdeel vormt van een groter geheel en dus - nog steeds theoretisch - mede invloed kan uitoefenen op het "grote" beleid via de overkoepelende bondsinstellingen. Ik voel me echter beslist niet geroepen invloed te gaan uitoefenen op het grote beleid; ik gun de betreffende ambtenaren op de ministeries en b.v. de direkties van landbouwkundige onderzoekinstellingen gaarne de verantwoordelijkheid voor het grote beleid. Terwijl ik dit schrijf, ben ik me er van bewust dat ik niet direkt bij het onderzoek ben betrokken, maar dat ik tevens in de administratieve - dus de meest kwetsbare hoek zit. In een officiële dienstkommissie schuilt naar mijn mening het gevaar dat direktie en personeel expliciet twee partijen gaan worden, die in principe elkaar al niet vertrouwen. Een informele kontaktraad - uiteraard met duidelijk omschreven taak, werkterrein en bevoegdheden - zou m.i. het geschikte medium kunnen zijn om te trachten direktie èn personeel te overtuigen van de noodzaak om als één team te werken en moeilijke situaties het hoofd te bieden. Binnen dat team is de kontaktraad dan de aangewezen instelling om "oneffenheden" van welke aard dan ook glad te strijken.

Voor wat betreft de organisatiestruktuur van e.e.a. kan ik me geheel verenigen met het voorstel van de Technologen.

J.H.W. van der Schild

On dienstenkommissie and democracy in I.B.V.L.

Following No. 10 of the familieblad, several points ha[s] come up in duscussions, including those in the New Year meeting on 2 Jan.
The following deals with two of them.

1. Dienstenkommissie. This suggestion must be seriously taken up for action. Before details, some thoughts on the principles and guidelines are shared aloud here.

In principle, the Dienstenkommissie must serve the purpose of looking after the economic and professional interests of the personnel, and of giving a democratic content to their participation in the institute activity. To be purposeful, all efforts are necessary to ensure tha[t] the Dienstenkommissie does not operate subject to the individual conveniences and whims, whether of the management or of the kommissie members, and does not beco[me] a mere object to satisfy the individual interests or show of democracy without reality. The choice is between an official and unofficial kommissie.

For a formal binding on the management from the start, an official Dienstenkommissie is the obvious choice. Howe[ver] its feasibility depends on the organised (ambtenarenbond) membership, present and potential in the near future, amo[ng] the I.B.V.L. personnel. In considering the approach of forming such a kommissie, following cautions are necessar[y]: (1). The decision should be willingly and formally (enrolled membership of ambtenarenbond) supported by a large majority. (2). The decision to appoint representatives on the kommissie must largely rest with t[he] local personnel, and not outside with the organisation (bond) centres; (3) The mandate for the kommissie must be broad to permit discussions on matters also of professional interest and of democracy within the institute.

In case the above-qualified official Dienstenkommissie is not possible, an unofficial one has to be formed. For the latter, a committment or assurance from the start mus[t] be secured from the management to accord de facto recognition to such a kommissie and its decisions, and i[n] no way subject it to the conveniences and interests of th[e] management.

In the absence of such understanding and agreement, the kommissie would be of no use at all.

The Dienstenkommissie, official or unofficial, must in practice, therefore, be a de facto recognised forum to discuss all matters of interest to the personnel, including their democratic participation in the institute activities. Such a kommissie must be composed largely (over 80 %) or totally of the non-academic representatives for the following reasons : Involvement and leadership of the academics most often relegate into background the interests of the large non-academic majority (80 % of the I.B.V.L. personnel) ; their positions and professional & articulate capabilities, derived from traditional social and economic privileges, provide the academics with usual advantages of multifarious channels and resources to safeguard and promote their own interests, always more than the non-academics; never being in a position to scuttle the interests of academics, any gains by the non-academics only add on to the benefits for the academics.

2. Democracy. According to the management, and also in commonly prevalent view, it is not possible to have democracy in the I.B.V.L., a research institute. For most people, democracy appears to begin and end as a political action by participating in periodic elections, and after elections leaving everything to the chosen representatives. Then it is for the Government formed, and through it for the ministries and departments and on the lower rungs for the management of the institutions, to run the whole show. Directing policies are determined at the higher central levels, and then details for implementation worked out successively lower in the hierarchial system. The people, workers and the personnel are merely expected to do what has been decided for them by the managements at different levels. In this democracy of periodic voting rights, the people are viewed as a herd interested only in jobs for salaries and other individual and personal benefits. Safety valves are provided in the set-up to demonstrate the possibilities of bargain for more benefits, subject to the relative positions of strength.

Even on the problems of I.B.V.L. reorganisation, the undercurrents of threats and assurances and of fears and hopes have been made to revolve round only jobs.

Such concepts of democracy, with no role for it in one work or outside in other activities, are very unfortunate. Basically they arise from nurtured and promoted feelings of the competence and privileged rights of a few to determine and decide the whole life and activity of the r of the majority. Barriers are thus created and maintained between the skilled and non-skilled, between the academic and non-academics, between the decision-making management and the working personnel. This is no place to go into th background philosophy of such privilege-ridden social systems, which would be over-hauled only by broad and powerful mass movements and struggles. However, one must point to possible beginnings in democracy even within the present situations.

Democracy and democratic participation in institute activities, in consequences, mean only the work being don by the personnel, not from fear of losing jobs or promoti or other benefits, but from ready willingness with conscious understanding and committment in the interest of common good.

It was in this context that a reference to the democratic urge of the personnel in raising issues in the last numbe of the familieblad was made. The real reasons for reorganisati and the whole future of the I.B.V.L. appear to be still f from clear for most of us.

In the immediate context of practice, democratic participation can take the form of a continuing machinery of discussions and consultations between the management and the personnel, individuals or groups (all of them irrespective of the salary scale) who are connected with an activity or are to be affected by a decision. Orders may invoke a response, but only under threat, and eventually make the whole activity merely a drag for the personnel. Take the following illustrations. When a perso is to be assigned a job, why is it done as an order, and not after prior discussion and consultation with him ? Similarly in case of project team formulations or team rearrangements or alterations, why is it not possible to involve in prior discussions all personnel, including the technicians and other non-academics ?

Management and academics are not the sole repository of ideas. In formulating projects and programmes, common discussions among all are bound to bring out good ideas. Any activity or a project or programme formulated in this manner is inherent with rapid progress. Such approaches for practice evidently need motivations for democracy and democratic participation. And equally important would be the needs for clarity about short-term and long-term objectives for institute activity, instead of subjective brain waves leading to wasteful activity in impromptu suggestions, some fiddling, rejection of the idea and groping for new ones.

Dienstenkommissie must undertake ensuring such democratic participation of the personnel in the institute activities.

Narendra Singh.

Een Nederlandse versie van Singh's artikel wordt opgenomen in no. 12.

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EN WAT NU ?

De balans van de reakties opmakend, dacht ik tot de konklusie te mogen komen, dat men op het eers[te] gezicht niet afwijzend staat tegenover het door de heer Wiertsema geopperde idee van een al dan niet informele 'dienstkommissie', zij het hier en daar onder enig voorbehoud omdat men eerst gaarne wil weten welke ideeën de direktie zelf koestert omtrent werkterrein en plaats binnen het huidige bestel van zo'n kommissie. En terecht, want het heeft weinig zin de diskussie en meningsvorming nog te intensiveren alvorens de prealabele voorwaarden van de direktie ons bekend zijn. Pas als die bekend zijn, kan eventueel een verdere diskussie op gang komen en zou het zinvol kunnen zijn een enquête te houden. De direktie c.q. de direktiestaf wordt bij deze dan ook vriendelijk verzocht op de kortst mogelijke termijn een duidelijk omlijnde mening te berde te brengen. Op grond daarvan zou dan een enquête kunnen worden gehouden onder de IBVL-medewerkers.

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PROJECT 'OPERATION FLOOD' FOR MILK IN INDIA

The 'Operation Flood', a Rs.1,000 million project, was launched in India in 1970 under the newly formed National Dairy Development Corporation under the sponsorship of international organisations, like UNICEF, etc. In its background was the great surplus of butter and other dairy products in Europe and America, as a result of overproduction in the sixties. As we know, surplus and overproduction in the capitalist economies refer to the quantities which in market have the tendency to adversely influence the prices, that is essentially the profits. In the past, such surplus used to be destroyed just to maintain the stability in market and prices, and to eliminate possibilities of any danger to the soaring profits. Burning of crops and dumping of grain into the sea have been common steps in the recent past, when the workers in U.S.A. and Europe were victims of the great depression and slump during the twenties and early thirties. Even in the fifties and sixties, when food shortage and mal- and under-nutrition in different parts of the world have been slogans of grave concern in the great publicity by FAO and others, the farmers in Europe and America have kept their fields fallow under heavy subsidy just not to grow foodgrains so that the prices and profits might not be affected. Such policies still continue, as being essential ingredients of the competitive, profit-motivated socio-economic systems promoting and manipulating markets. Now, in these pursuits new venues and new channels have come to be handy with the concentration of economic power and of technological capabilities in monopolies, giant cartels and the multinational corporations. The international agencies and other aid or relief organisations with their experts are the new subtle media, as also the local experts and the privileged groups, with the III world countries as the continuing fields of operation for further aggravated pursuits for profits in the immediate and long-term perspectives. It was under this approach that thousands of tons of butter oil and milk powder were, essentially as outlets for the then-surplus of late sixties, diverted from Europe and America to India under the much lauded World Food Aid Programme to launch the 'Operation Flood' project for milk in 1970.

Both the native and foreign experts had projected the fancy that a flood of imported milk products would lead to a sequence of developments, dramatically increasing the supply and ultimately creating a self-sufficien[cy] of milk and milk products within the country by the year 1980, i.e. figuratively a local flood of milk. As usual, the projections included measures for modernisation in techniques and technology and incentives for

foreign investments and imports. The details comprised of improvements in dairy plants for better yields and in cattle for quality, setting up of feed processing factories, and also creating an economic squeeze on the urban cattle owners, particularly in the metropolis and state capitals, to move them out into the rural area. Very promising appeared these pronouncements of the Corporation Chairman, while launching the project, which woul according to him finally lead to remarkable improvements in overall milk production and processing under efficient and hygienic conditions. For reality of trends and implications in practice, however, one has to analys the sketchy reports on the project. For our purpose, we make a particular reference to reports in an international dairy journal from U.K.

One report deals with the Bangalore Government Dairy and its plan for utilising its surplus milk for production of initially of about 1,000 kg of ice-cream mix per day. This dairy was already converting a part of its surplus into curd, and was in a position to to market bottled curd in small quantities through its booths and to undertake supplies in bulk. It was producing 800 kg of butter daily, but could sell only half of it, and its returns from butter and ghee were very low. Procurement of milk by the dairy had increased to 460,000 litres/day with its average daily sales at about 43,000 litres. A farm cooler of 2,000 litres capacity had been installed at one of the collection centres, more were proposed for others, and a new cold storage of 40 tons capacity was under construction. One of the major problems faced by the dairy was marketing in keen competition from private producers. (Ref. Dairy Industries, June 1971, p. 357).

Another report, about one year later, concerns with the developments in other regions of the country. At Baroda in Gujarat had been installed an automatic machine, first of its kind in the country, for retail milk vending against a token in the slot. UNICEF had given the first unit of this equipment under the 'Operation Flood' scheme, launched to achieve self-sufficiency in milk by 1980. Similar machines were proposed for other major cities in due course of time. These machines would help in eliminating the long queues before the milk booths. And for Patna in Bihar, it was proposed to set up a dairy plant with a capacity to handle 120,000 litres of milk per day. The programme also included provisions for technical inputs such as fodder, fodder seed, medicine and veterinary aid to milk producers, and a proposal for setting up a processing factory for balanced fodder of 150 tons daily capacity. (Ref. Dairy Industries, May 197 p. 270).

One must realise, in the first instance, that these reports are presented for consumption of the vast majority in Europe and America and for a small minority elsewhere, especially the English educated elite in the III world countries. Those in the industrialised and technologically advanced countries are made to believe in these news of developments as signs of progress in accordance with their own past changing to their present affluent life. They have been and continue to be nurtured on beliefs that their present affluence has no relation with the former imperialist and colonial policies of the regimes in Europe and America, nor with the present neo-colonial policies of the ruling interests of their countries, in past and present exploitation of the other countries. Such reports also pamper the ego of self-imposed benevolence of these people for the poor countries, assistance to which have been virtuous slogans of publicity and propaganda in the modern world. The elite in the III world, generally the products of the Western education and training, reflects closely similar approaches in efforts and outlook for assessment Thus, the purpose of reports, under reference, is mainly served in evokin a general satisfaction on the part of readers.

However, a critical analysis of these very reports would also reveal interesting and remarkable information about these developments. First, let us take the nature of assistance from the United Nations Childrens Fund (UNICEF), which professes actions and programmes for the needy children. UNICEF has given an automatic milk vending equipment, as an experimen tal unit to promote more installations, which have to be subsequently imported from the manufacturing regions. It must be mentioned that such an equipment is not in use even in Holland, that country of milk and dairy products, where it was discarded because of unsatisfactory operations of handling, refilling and servicing. Remarkable is the UNICEF assistance in promotion of market for such an automatic machine in India, a country of wide climatic and seasonal variables with consequently more likely adverse influences on operational efficiency, and that too to reduce pressures before milk booths, more personnel in which for milk distribution can only be beneficial to reduce unemployment. Then such modern milk-vending facilities can in practice be availed of only by the rich and educated minority, since the purchasing capacity of the vast majority is so low as to keep milk beyond the reach of most of those whose children are in real need for the minimum nutrition. Not pointing to self-defeating purpose of UNICEF or other international agencies professing similar aims, instead this in only one more illustration to expose the real face of such aid

On dairy plants, obviously the central theme of the operation, the following picture emerges. In general, these plants are based on collecti and procurement of milk from the surrounding areas for channelling suppli for distribution of milk in urban centres and for processing into various products. It was remarkable that an existing dairy plant in a densely populated state capital (Bangalore) was selling only 10 per cent of the total milk procured. Evidently this was not due to dearth of people in number as such, but only from a lack of customers with the large majority not having the adequate purchasing capacity. The eventual surplus was being processed progressively into more sophisticated products, further limitin the scope of sales to increasingly narrower circles of the more affluent customers. Inspite of this, expansion plans were afoot for increasing the procurement, storage and processing capacities at this plant. Then a new dairy plant was proposed for another state capital (Patna), with others to follow. One does not have any reasons to assume that the pattern of performance at Bangalore Government Dairy, as reported, would not be repeated at Patna or at other centres to come. Instead, similar experienc are bound to recur in the existing socio-economic situations in the countr But then the question arises: why all this ? For an answer, one has to go into the context of these developments and of their promoters.

Such dairy processing ventures had already been started sometime bac in the form of private sector plants under foreign subsidiaries, like Hindustan Lever and Glaxo. Western U.P. has been their seat of activity for more than a decade. The Kaira Dairy in Gujarat, well known for its Amul brand (butter, cheese and baby food) among the affluent customers, has been expanding with foreign assistance, particularly UNICEF, etc. As mentioned earlier, the latest project 'Operation Flood' is merely a legac of the then-Butter Mountains of sixties in Europe and America. But this time, following in the footsteps of ventures, it is a more grandiose plan on a national scale under public sector. Interestingly, the Chairman of the newly formed Corporation is the man behind Amul. Collection and procurement of milk from the rural milk producers is done in the name of efficient and hygienic urban supplies and for processing into products fo wider distribution. Various promotional efforts are often projected under all such ventures, and sometimes even implemented. Any increase, ..., what-so-ever in the latter case, is invariably procured by the promoters for subsequent processing and sale.

As obvious, the processed milk and milk products are commonly beyond the means of the vast majority of the urban masses. Under efficient procurment programmes, now that the milk becomes a cash commodity, another adverse effects has come into operation with respect to nutrition of the rural populations and consequently to their health, well-being and performance. Formerly milk, subject to rapid spoilage on storage, had to be soon processed locally. Then ghee was the cash commodity and the butter milk (matha or chhachh), a very nutritious protein-rich fluid, was abundantly available in rural homes, practically in flood. But no more any longer, with the institution of efficient collection and modern storage as part of the procurement machinery under the new ventures.

In practice, therefore, it is not the vast majority of the rural and urban masses, who benefit from these ventures for whom they are professed to be started ~~for them~~ The only beneficiaries of such or any other ventures under the current socio economic situations are the following:-

The monopolies and multinational corporations of the industrialised, technologically developed countries of Europe and America fostering demands for new products and new equipment under the garb of assistance and advice, both through foreign and local experts, to create new markets in India and probably also for an eventual production with cheap native labour for supply of products for the homelands;

The native business concerns and groups and individual businessman, subserving the foreign vested interests and sharing in the loot;

The bureaucrats, technocrats, and the professional and educated elite, ideologically and self interestedly subservient to and promoter of the profit-motivated and management & technology oriented systems, transplanted from the West, and totally unconcerned with the present and future of the native society and the masses of people.

Wageningen: March-April 1973
I.B.V L. (Nederland).

Narendra Singh

programme to develop technology and industrial processes which are expected to carry the major load in future food production.

One important approach is also to use industrial carbohydrate-containing materials and develop technology for efficient conversion of large quantities of waste cellulosic materials (or wood) into fermentable carbohydrate and proteins.

Chemically synthesized food, fish protein concentrate and oilseed protein meals have prerequisites for human consumption. Some of the less biologically defined new food products, like single-cell proteins, could at this stage be used to replace fish protein concentrate and oilseeds in animal feed. This switch would at the same time provide more information on the nutritional value of microbial foods.

There might be a possible problem in the utilization of single-cell proteins as human food because of the higher nucleic acid to protein ratio which at higher levels may give rise to high urea and uric acid blood levels; however, methods to produce low nucleic acid cultures or eliminate nucleic acids by technological treatment have recently been developed. Allergenicity to the unusual proteins should also be considered which is possible especially in infants sufferin[g] from lesions of the gastro-intestinal tract. In addition to this, we have to be prepare[d] also to face some unknown problems associated with new food to which we ar[e] not yet accustomed.

Complete information on the biological, nutritional and toxicological factor[s] as well as acceptance of the new foo[d] products is imperatively needed for thei[r] evaluation. This information might significantly influence our unconventiona[l] food strategy indicating the right valu[e] and need for development of this mos[t] advanced revolutionary approach in foo[d] production.

Singh: research is on the wrong track

The last few decades have witnessed among experts all over the world and on the part of the international agencies, particularly FAO, WHO and UNICEF, a great buildup of serious concern with, and a highly publicized crusade against, protein malnutrition and its growing acuteness especially among the less privileged people in the developing countries of the Third World. Stimulating research has led to new sources and new processes for increasing the supply and improving the quality of protein foods. A growing fund of basic knowledge on the harmful effects of malnutrition has also accumulated during this period. It is time, now, to assess the relevance of all these efforts against the practical realities.

The situation regarding protein malnutrition, in an overview, may be summarized as follows. In the industrialized, developed countries, problems arise not from a real shortage of protein foods, but from the social and economic trends promoting unbalanced and overemphasized shifts toward animal meats and other foods, as products of sophisticated technology, centralized processing and labour-extensive production systems, and leading to rising costs of food. In the underdeveloped countries, the supplies appear to be short, but more significant is the nonavailability of adequate and nutritious food for the great mass of the common people, due only to economic factors. The situation is made more acute by the widening economic disparity locally between the affluent minority and the poor majority, and from the widening economic and technological disparity between the developed and underdeveloped countries. Thus, the problem of protein malnutrition in general has persisted and continues to be aggravated, not so much from short supplies of protein foods in different parts of the world as from social and economic factors.

Biased market economy

In the field of protein food production and use, some trends may be seen. In the industrialized countries, progressively growing labour-extensive and technology-oriented approaches are leading to increasingly intensive animal production, with increasing shifts to greater grain dependence in ruminants and to greater nonruminant production. The most obvious emphasis on poultry meat stems from the broiler's ready amenability to technological handling and processing. The overall consequences ar[e] progressively decreasing efficiencies o[f] animal and total agricultural productio[n] in terms of land.

The inevitably increasing costs of animal foods are accompanied with intensive promotion of textured vegetable proteins (TVP) as meat substitutes in the name of cheapness, but essentially because of the technological amenability of the raw materials used. The increasing dependence on technology and capital in food production and processing, despite the inefficient resource utilization and adverse economic and nutritional implications for the common man, arises from the dictates of the profit-motivated enterprises of large industries an[d] multinational corporations.

In the underdeveloped countries, th[e] forces of a market economy and a consumer society operate in such a way a[s] to render more expensive and scarce th[e] indigenous, nutritional, traditional animal and plant foods formerly accessible to all. These commodities ar[e] now diverted either to satisfy the growing demand of the affluent minority o[r] exported and processed accordingly in local plants. At the same time a shift from staple food production t[o] cash crops also occurs, for the sam[e]

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sons. Regardless of the state of production and supply of raw materials, food processing units multiply. Examples are: increasing numbers of milk processing centres (fluid milk, milk powder, cheese, baby foods, etc.), meat processing units, poultry feed manufacturers and broiler farms, edible oilseed meal processing units, and other food and feed processing centres.

Even the various benevolent programmes, promoted by international and other foreign agencies in the name of better nutrition for the underprivileged, centre around production and distribution of processed protein foods and mixtures.

Beyond reach

The overall emphases continue on technology and capital-oriented production and processing, with increasing dependence on the multinational corporations based in the developed countries. In consequence, the traditional nutritious foods — and all the more so the processed ones because of still greater costs — remain beyond reach of the rural and urban masses with their growing impoverishment and diminishing purchasing capacity.

The relationship between work performance and nutrition was an early discovery. This was followed by knowledge of the need for better nutrition for growth, later even for brain development, going back from childhood to the earlier infancy and the pre-weaning period. Later discoveries have shown the need for better nutrition of the mother during pregnancy, then during all her life, then the mother's mother and lately even the mother's father. The role of nutrition in the earlier ancestors may be the findings yet to come. The importance of the family and surrounding environment, and of the overall social, economic and psychological environment, both distant and immediate past, has also been indicated.

What is the practical significance of all this information? Not only has this "awareness" led us nowhere closer to solving the practical problems of the needy, but it has proved to be not really new as might be thought. In all agricultural societies, as part of the accumulating empirical common folk knowledge, mothers have known the need of their pregnant or nursing daughters for better nutrition for satisfactory growth and development of children. Purchasing power has always remained the sole limitation.

Protein research shows several new promising sources and processes. However, it also reveals a bias in support of the further development of some and not others, regardless of the questions of production efficiencies, cheapness, simplicity in processing, and other factors. One may refer, for example, to leaf protein research started over 40 years ago and to the petroleum-grown yeast protein (SCP) research, only about 10 years old. Both are presented as foods of the future by experts of international repute, but in practice it is SCP which is given extensive backing. Even the waste carbohydrate-grown yeast and fungal proteins have failed to get support.

In terms of total production efficiencies on land, however, leaf protein in integrated programmes with fodder production has very obvious advantages. But research in this area remains negligible compared with other materials, including soybean, even in countries dependent on import of such materials and incapable of growing them locally. In general, material and process-improvement research continues receiving major attention for developing meat extenders, cheap meat substitutes, protein fortifiers of beverages and fruit drinks, etc.; but alongside are glaringly missing R & D efforts to check decreasing, and to promote increase in, animal productivity in terms of land use, to improve overall land production efficiencies, and to forestall the rising costs of common animal and other foods.

This general pattern of research and development regarding protein foods prevails in the protein-deficient underdeveloped countries as well. The Indian example may be cited. The predominant emphasis in R & D for technology and processing far outweighs attention to increased production and availability of simple protein foods, such as legume pulses, buttermilk, etc. With no concern for the raw materials themselves, the experts go on highlighting milk and meat extenders, based on technologically processed vegetable and other proteins. Research on TVP gets promoted on priority for producing chewy meat-like products, even in this most publicized vegetarian country. Petroleum-based SCP research gets very much more support than the highly potential leaf protein. Lysine supplementation of cereals in baked bread or elsewhere becomes a significant R & D activity, overshadowing the well-known mutual supplementary benefits of cereals and legume pulses in the traditional and common dietary patterns. Genetic improvements of cereals for protein and for lysine, to make them complete single foods, are major R & D themes accompanied by the slogans of the developed countries. Soybean research finds extensive promotion for attention as an oil protein crop. This, when the groundnut is an established high oil crop, and the soybean does not even fit in the common diet as a cheap, traditional food. R & D on local raw materials (e.g., groundnut and legume pulses) either gets downgraded under the pressures of the use of imported raw materials or mixtures, like CSM (corn, soy and milk from the U.S.A.), with the existing processing units closing down, or receives some support only when geared to production for export of the processed materials (e.g., edible grade groundnut meal). In consequence, under the guidance of experts from North America and Europe, the obvious trends in R & D are toward the use of technological raw materials and their industrial processing for purely market economies.

Inevitable models

A serious analysis of the factors operating behind such R & D trends shows that the scientists and experts, while sincerely professing social motivation, have apparently suffered from certain socio-psychological tendencies. They have considered R & D achievements and applications (in food or otherwise) as independent outgrowths of their individual efforts. Divorced from the history of social development, they have been viewing their own socio-economic system and their own socio-cultural attitudes as the inevitable models for all others. One must keep in mind that almost all research inspiration and motivation even in the underdeveloped countries have been conditioned by science education and training along the patterns of Europe and North America, with their environments permeated with ideologies of individualism, free enterprise and the

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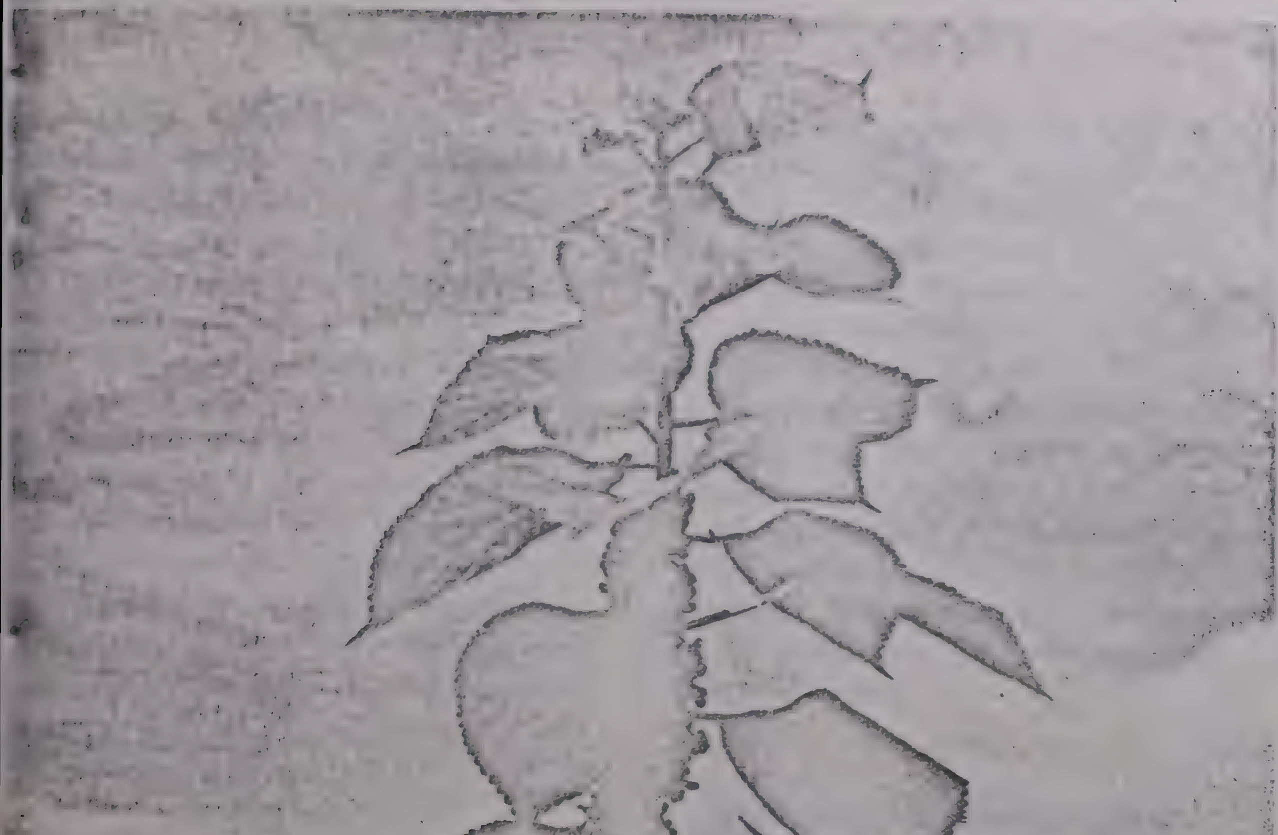

FROM THE FAR EAST A PARTIAL ANSWER
Ramie (Bohemeria Nivea) one of the best protein-yielding plants

market economy. Generated from their status in society and in the world, the feelings of self-developed elitism, paternalism and benevolence give rise among the academics to an outspoken and obsessive concern for the problems of others: the less privileged elsewhere. They profess to take upon themselves and engage in tasks to solve such problems.

In practice, however, the trends in R & D and the developments in production continue to be essentially shaped by the interplay of the ruling economic and political forces on the national and international scene. One may, for example, again refer to leaf protein, SCP and soybean, in attempting a brief analysis. In its early stages, leaf protein research in the U.K. found official support during the impending crises of the last world war, but none afterwards. Later efforts have continued mainly under "philanthropic" support, aiming at solving the protein needs in the poor countries, with a very minor proliferation of interest in the latter and only from personal contacts. The nature of raw material (local, fresh greens not amenable to cheap and easy transport), the purpose aimed at (for the poor in uncertain areas), and the level of technology pursued and recommended (simple, low capacity and low capital biased) did not prove to be ready incentives for the ruling forces to give active official and economic support to leaf protein research. It just did not qualify for promoting their interests, i.e., capturing markets for profits.

In contrast, the much more recent SCP research received from the start all sorts of ready support from petroleum and other interlinked economic and political interests. The discrimination from an interplay of the forces of vested interests finds one of its most obvious expressions in SCP and leaf protein. During the last few years, some official support for leaf protein has become evident, but only in countries where research is pursued as an adjunct to the established feed dehydration and processing industries (e.g. U.S.A.), or for replacing the imported feed ingredients (e.g., Hungary) or the imported food ingredients (e.g., Sweden). This generates some interest among the equipment manufacturers as well.

Soy interests have extensively supported specific R & D use of the soybean. TVP promotion is the latest manifestation of their pursuits. In India, even research on groundnuts was supported by North American interests because of the market potential for soybean technology. Now overt and covert promotional pressures have started to displace groundnut by soybean, even in raw material research and development. More detailed analyses in diverse fields of protein foods would produce additional evidence of discriminatory support, a common pattern operating in both the developed and underdeveloped regions.

A new emphasis and reorientation in approach are very necessary. The giant corporations of the industrialized and developed countries aim consistently at increasingly capital- and technology-intensive systems of production, nationally and internationally. But this has no relationship with socially useful R & D, which demands conscious and positive action in the interests of common people everywhere.

In the light of past experience, the most obvious need is to give up, and to expose the dangers and fallacies of, the paternalistic and benevolent feelings of a self-imposed obsessive concern of an elitist status group for the less privileged. This attitude not only condones the privilege-ridden social systems, but even ignores that the problems of food and nutrition, as others in such societies, require economic and political solutions as the first steps, involving a complete overhaul of the social system itself. Engaging purely in research, technological and management solutions, or proposing

:m through local or foreign experts d agencies is not only irrelevant, but ys into the hands of vested inter- s, causing a further aggravation of the oblems. It must also be realized that research on even the most promising urces and processes could really pro- ss and be socially useful unless it ves the needs of the local people and ts the support of the national interests. Nor can research be really useful un- s it simultaneously opposes inefficien- s and inequities arising from the operat- socio-economic and technological stem, and actively promotes improve-nts in exploitation of resources and cesses toward greater production and der availability of the materials.

In the industrialized countries, R & D grammes on novel protein sources d processes can have no real social aning unless, while exposing the grow- inefficiencies in the current food pro- production systems, they aim at in- asing the overall production and avail- lity, and at reducing the costs, of mon protein foods. In this, efforts e to be toward developing sources l processes to decrease the grain de- dence in animal production, including the nonruminants, and to reduce the dependence on imported feed and food ingredients. R & D programmes on leaf protein, for example, must aim at the use of juice and coagulated material as feeds for nonruminants and young cattle, and as meat extenders in human food, in close integration with fodder production from the intensively fertilized green forage and other by-product greens of local agriculture. Special efforts for R & D and knowhow, free of proprietary rights, would enhance their social value by availability and use toward solutions everywhere.

In the underdeveloped countries, the experts have an even greater responsibility: to assist, in all possible ways, the political process of a complete overhaul of the socio-economic system. Their approach both in their specialized fields and in general has to be very much integrated, comprising mainly the following aims: increase in availability and in production of materials in forms and at costs amenable to the largest majority of local people, opposition to economic and technological imperialism, developing self-reliant agricultural and industrial production, proliferation of science and technology among the common people, accumulating information by nonsubservient and growingly self-reliant R & D to serve the interests of the common man and, most important, active participation in the struggle for liberation, freedom, democracy and progress. Science and technology in general, and R & D of protein or other foods, have no meaning, unless they follow the above aims.

For a general guideline, one may begin with a reference to the recommendation of the White House Conference on Food, Nutrition and Health, held in Washington in 1970:

"The problem of mulnutrition should be attacked with emphasis on nutritious and traditional foods that people are accustomed to consuming . . . and the thrust of our efforts should be toward protecting and developing this supply. This should not preclude the fortification and supplementation of traditional foods and development and introduction of new foods, particularly such new food products as may offer significant nutritive value at low cost. The latter, however, should be presented and should find their place . . . on their merits and not as special food for the poor."

Leaf protein concentrate

With regard to the present interest in the development and use of various "unconventional" protein concentrates, though recognizing the limitations on them, the PAG does not feel it appropriate to give a simple recommendation for or against further work on leaf protein. It notes the good biological value and useful vitamin A content of leaf protein; the many sources from which it can be prepared; the several forms that the product can take; and the possibility of integrating production with the preparation of other products as a means of reducing costs.

The Group, however, draws attention to certain disadvantages of leaf protein compared, for instance, with oilseed protein concentrates. These are in particular its colour, flavour and lack of stability in the less processed forms and its lack of economic competitiveness in the bland, stable powder form. The balance of expert opinion from various research groups is that the idea of small-scale village production of the crude leaf protein product is impractical. PAG endorses this view.

Leaf protein has then to be judged in terms of the bland, stable powder form, which would be produced on a large scale and which would, therefore, be exposed to direct economic competition with oilseed protein concentrates and perhaps eventually with fish protein concentrate and single-cell protein as well. As with certain of these other products, the Group sees the possibility that leaf protein might be considered initially as an animal feed supplement.

A crude product, produced from alfalfa and containing 70 percent protein, is likely to cost at present 10-20 US cents per pound, not including profit or marketing costs. For a solvent-extracted product, the price would be two to three times higher, even with the economic benefits of large-scale production (25 million pounds per year of product).

PAG recognizes that further research on a laboratory and pilot scale into the feasibility of leaf protein sources and methods for their extraction would be most desirable in appropriate institutions.

In view of the large amount of data already available and the limited practicality presently indicated, it does not accord such work a high priority or recommend the use of funds intended for the assistance of developing countries.

PAG feels that any major expenditure on large-scale processing operations in a developing country, even if these were of an experimental nature, should only be embarked upon after a thorough feasibility study. This would take into account all the relevant factors such as type of product, process control, manner of distribution and costs of production (estimated reasonably from earlier work) and comparison with alternative routes to the aid objective.

Uganda And The Asians

NARENDRA SINGH

WHEN early in August 1972, President Amin of Uganda gave a call for repatriation of all British Asians within three months, the British led the diatribe against Amin. "Insane" and "megalomanic' etc. were among the numerous epithets used. The real and imagined plight of the Uganda Asians, as victims of racial persecution, remained for months to come a major theme in the press, on radio and television in Europe. This fitted in the drone of subtle propaganda, constantly pointing to the backwardness of the non-European peoples, in general, and to the Africans in particular—they are crude, primitive and inferior people, in contrasting relief with the superior civilised whites. This is in glaring contrast with the mere expressions of compassionate sorrow or anger shown on the situation in Vietnam, South Africa and Rhodesia, probably in subconscious reaction to the overtly gross non-Christian behaviour of their white compatriots in the USA and Africa. The subtle propaganda and publicity against the blacks and browns, and about their backwardness, through various mass media serves useful purpose: among the local populace within the developed countries, beliefs in the superiority of the Western social system are maintained and gratitude to it for their current better living nurtured; and among the alienated elite and middle-privileged groups in Africa and Asia servility to the West is promoted.

With the heat somewhat mitigated, it seems relevant now to look at the fate of the stateless Asians and their context in Uganda. According to the UN High Commission for Refugees, there are over 2650 stateless Uganda Asians in Europe, some still in transit camps. Talks with a group in Holland and information from the press form the basis of this report.

In Holland at present there are 57 families of Uganda Asians. Holland has offered to take 300 such Asians to be allowed to seek jobs, in the first instance, under temporary residence as Dutch citizens. The present 57 families consist of about 250 people. The mass media had, in the usual sensational manner, covered the visit of the Dutch delegation to Austrian camps, the offer made to the refugees, their coming to Holland, the early stages of their settling down in the camps, and their expressions of relief and gratefulness in finding a haven. Snippets on them continue to find publicity off and on.

Over a thousand in the Austrian camps, where they had been given transit accommodation, had expressed their eagerness to come to Holland. All of them, family-wise and individual members of each family, were interviewed by the Dutch delegation before selection of the first batch. Only five or six families in the present group appear to have no working adult, with the family head either too old or otherwise incapable of working in Holland, but they do have children who will reach working age within a year or so. In all, about 70 of the Uganda Asians in Holland belong to the category of working people. By profession, about one-third of them are technicians (motor mechanics, electricians, TV and radio repairers, watch and sewing machine repairers, turners, plumbers, masons, shoe makers, etc.), seven lorry or truck drivers, a few tailors and the rest with a business background (dealers and agents for various equipment and goods, transport agents, shopkeepers or assistants, insurance agents, etc.).

They are temporarily housed in two camps. The smaller one (Zonnebloem, literally meaning sunflower, in Bennekom) visited by this correspondent, has 16 families. The tenements here were raised more than two decades back to accommodate the natives of former Dutch East Indies, seeking refuge in the early days of the Indonesian struggle for independence. With only a few under occupation of the Spanish "guest workers" for some years, the rest of the tenements have been lying vacant. The remark of a Dutch carpenter in the team engaged to renovate the tenements that they were unfit for living, was noticed with concern by many. Each house has one or two rooms with sleeping bunkers and a living room with a traditional old-type gas heater. One would be chary of passing the North European winter in such tenements, and that too one from the tropical Uganda in one's very first winter in Holland. So far the winter has been unusually mild and thus kind to the visitors. In due course, the families in groups of twos or threes are expected to shift to accommodation close to their places of work.

In their first reactions, the Asian settlers have indeed heaved sighs of relief in finding sanctuary in a country of Europe. For them the Dutch are very good and kind people. Many common Dutch people, in their benevolent concern and pity for the poor miserable refugees, have shown great hospitality and showered them with lavish presents of assorted items. Local authorities and the Red Cross have arranged weekly cash grants to the families, according to size and age, to meet the bare minimum for food provisions and other common requirements, and some incidental personal expenses. With no grouse on this account, the main concern of the Asians has been finding suitable jobs for themselves and education facilities for children. In preparation, almost all are attending regular classes specially arranged for them to learn the Dutch language. In general, the Asians appear to be full of

confidence that they would be able to settle down in Holland.

Job opportunities are uncertain. The Dutch Government's policy is far from clear, with only vague promises. A British firm, a rare phenomenon in Holland, has taken one person who was associated with its business in Uganda. The drivers have, now, got their licences to enable employment with the transport agencies, but of practical value only after gaining knowledge of routes and areas and expertise to deal with the Dutch/European traffic. Technicians of Ugandan background have to strive hard for jobs suited to their trades and skills in modern industrial Holland, totally different in respect of technological base, mode of employment and work performance. Similar problems face the scores of non-technicians, aspiring for jobs in stores and godowns, shops and custom offices, etc. There are of course many back-aching and line jobs, left by the Dutch in their current affluence and snobbishness as lowly, menial and unfit. Several thousands swarm for such jobs from the poorer Greece, Italy, Morocco, Portugal, Spain, Turkey and Yugoslavia. These foreigners, in sophistication called "guest workers", are an asset to the national economy according to the Dutch Central Planning Bureau. Uganda Asians are aware of such jobs, but consider them too heavy, particularly for the middle-aged and those with business background.

Racial tension in Holland, in contrast with Britain, has been remarkably absent. Migrants from Indonesia, Surinam and the Dutch Antilles form a small fraction of the population, and the foreign "guest workers" take jobs rejected by the Dutch. But there are portents for the future in some recent developments. Persistent acute housing shortage in this densely populated country, containing the seeds of tension, has in the recent past led to incidents and feelings against the Turkish "guest workers", who happened to benefit in some house allotment programmes. Then, recently early legal steps were urged by the Dutch Minister of Justice to curb the increasing inflow of coloured immigrants to check the growing dangers of "apartheid", racial explosion and tension. and erosion of the non-discriminatory policies in vogue. He made a particular reference to the people flocking from Surinam to share the local social benefits of Holland, where decent houses and jobs are being denied to them. The tiny group of Uganda Asians is of no significance in the vast horde of other immigrants and foreign "guest workers" but, it must be prepared to face and share the problems, particularly of the non-white populations in the Holland of future.

Why Stateless?

Most of these Asians, entitled to Ugandan citizenship, were unwilling to stay. Some were entitled to Indian or Pakistani citizenship, and others could have made justified claims because of their origin. But all of them decided to float as stateless UN refugees with no promise of home and job at the time of option. Why so?

For unwillingness to stay, not so much the loss of privileges as the threat of being moved out to the villages became the determinant factor. Almost all Asians in Uganda lived in towns. Their attitude to the native Africans was even worse than that of orthodox South Indian Brahmins towards untouchables! Socio-psychologically, they just could not think of, and reconcile to the idea of, a life of mingling with the rural black Africans.

The idea of going back to the original homelands in India or Pakistan either did not occur. The legacies of experiences which made them or their ancestors migrate were there. They well knew of the wide poverty and lack of opportunity in those lands. Their correspondents and compatriots, having gone back in the past. also discouraged them by telling them of possible welcome only for the rich. Promise of one-way passport, with no other assurance but freedom only to join the vast, poor and unemployed urban milieu in India or Pakistan, was no incentive even for those directly entitled to the citizenship. Also, the Indian and Pakistani diplomats, dictated by their alienated and servile traditions and attitudes, advised the harrowed Asians to opt for the UN refugee status, as holding some promise for the future. For several, the decision was also directed by the choice of the youngsters in the family. The latter, with their acquired mode and style and living customs of the British in Uganda, were eager rather for a country of Western traditions. Thus, the Madhwanis. Mehtas and the ilk, with their privileges, easily manipulated sanctuaries in the U.K. and in India or Pakistan in safe footholds of business, but the unfortunate, like the ones in Holland, turned into stateless UN refugees, looking for promising havens in Europe, etc.

Migrants from the Indian subcontinent, beginning with the nineteenth century, were later particularly encouraged by the British in their colonial expansion, because of the Asians' capabilities to penetrate deep into the African countryside. Finally. in the colonial set-up in East Africa, the Asians soon formed the middle socio-economic stratum below the British but well above the Africans. During the post-World War II changes in physical presence and direct hold of imperialists over the colonies, the Asians in East Africa began acquiring an increasing hold over the local economies, independently or as local agents of the foreign interests, including the British. In Uganda, by the time of independence, all business and professions had come to be concentrated in the hands of Asians. They had their own usual socio-economic hierarchy, with the Madhwanis and Mehtas topping the list. The latter and their clan, with wealth and other manipulations, had also acquired concurrent business interests outside Uganda in the U.K., India

and elsewhere. Activities of this group of affluent Asians against the Ugandan interests combined with other factors, caused an eruption of anger among the African leaders.

Most Asians were living in towns, with only some unfortunate ones running rare shops in the villages. Benefiting from education and other privileges, lacking for the common Africans, the overwhelming majority of Asians, as traders, professionals, civil servants, teachers, etc., commanded standards of living far above the Africans. Even an ordinary Asian household had three African houseboys, i.e. personal servants. Most Africans in towns were in the employ of the Asians, on back-aching and drab jobs. Some of the older Asians knew one or the other African dialect, but none of the youngsters. Therefore, English was the only medium of communication between the Africans and Asians. The younger Asians did claim friends among Africans, but only among the educated urban elite. The Asians, as did the Europeans, thought of the black Africans, in general, as beings of a lower order. The legacies of stratified social, caste and class traditions of the Indian homeland only made easier for the Asians to take on, with greater exaggeration, the socio-psychological attitudes of superiority of the white masters in relation to the black Africans.

In essence, the Asians were totally alienated from the African masses by sustained and promoted social, cultural and linguistic barriers, and in socio-economic relations they had become antagonistic to the African society and masses.

African Context

The two facets of the neo-colonial trends in black Africa, as elsewhere in the Third World countries, are on one side the benevolent aid and assistance programmes and, on the other, a continuing "stick and carrot" policy, particularly on the part of imperialist and neo-fascist regimes.

In the recent past, substantial fraternisation has begun between the Europeans and Africans. Since independence, the number of Europeans in teams or individually has progressively increased in the new African countries. They are engaged in socio-economic studies and investigations for solutions of the "problems" faced by the new countries. Or they are working in "development assistance" programmes. Support and sponsorship for such studies and assistance programmes comes from the national bodies or multinational groupings directly or through various other channels, including the UN and other international agencies. In all these new education, training and development ventures, a special emphasis is laid on Africans. For example in Uganda, special training centres for business administration have been opened for the Africans, excluding the local Asians who do not need business training, according to the European advisers. State trading corporations manned by Africans have been floated in Uganda with the assistance of Europeans. These efforts form essential ingredients of the neo-colonial policy in the developed countries with the aim of, among other things, building up an educated African elite, alienated from the local African masses and servile to the socio-economic and political systems of the West and the dictates and demands therefrom. The local Asians, having had served their role in the earlier colonial expansion, have no place now in the modern neo-colonial programmes in East Africa.

The "stick and carrot" policy of the modern neo-colonialists is most evident in Vietnam, whose "reconstruction" all Europe is now clamouring to assist, with the cessation of direct U.S. aggression. Pressures and promises form part of this policy in Africa as well. Tanzania and Ghana have been facing this policy. And this time Uganda is experiencing it. As usual, the press and other media have played a significant role in the psychological preparations in this direction. The British press was in the forefront for the obvious reasons and, in the experience of this correspondent, it was aptly represented in the daily *Guardian* and the weekly *Economist*. During the period of sensation harrowing reports and allegations of carnal rampage by the African soldiers, based on claims of angry and frustrated repatriates and of other eyewitness accounts, were published. The same press, with no apologies, reports now: "But the most remarkable about the Asian expulsion was that it was accomplished with so little loss of life. Cruel, quick and ruthless it certainly was, but given that the regime was fighting for its life in September and given the unpopularity of Asians, there was surprisingly little ill treatment during the enormous human exodus. The Biharis of Bangladesh and the Sudetan Germans of 1945 did not get away so easily". (Martin Walker in *Guardian*, January 18, 1973). Why this objective report now, and the hysteric venom earlier? Having failed to obstruct the process of developments in Uganda earlier by threats, the neo-colonial pattern demands shifts in approaches and preparations for other forms of infiltration.

The story of the expulsion of Asians from Uganda would be incomplete without a reference to the broader context of resurgence in Africa. The expulsion of Israelis, Asians and British in sequence from Uganda has been a matter of economic independence, in efforts of nation-building on the part of African leaders. Of course, there are weaknesses in the movement. It has to be become more politicised, more militant. It is necessary also to identify the local forces of vested interests, reaction and servility to the imperialists and neo-colonialists.

D E M A N D S F O R P R O T E I N S I N T H E W O R L D - R E A L I T I E S A N D T A S K S

SUMMARY

A survey of the demands for proteins in the world shows two clear trends. In the most populous agricultural countries of Asia, Africa and Latin America, there are demands for more proteins and for better quality ones, but most urgently for their equitable distribution, as part of food in general, while in the industrialised countries of the West and East alike, the demands continue for more and more animal proteins.

From various platforms, as part of extensive publicity on the problems of protein malnutrition, shortage and the impending crisis, multi-directional suggestions for solving the problems have been made in the past. They continue to be reformulated and presented in new phrases, but there are so far no indications of getting closer to solving the problems. The fact is that as against over-eating by less than one-fifth of the world population, over one-half to two-thirds of mankind continues to suffer from undernitrition and/or malnutrition. The well-meaning suggestions have not only failed but in practice led to further aggravation of the problems by subserving the forces which go on taking advantage of the technological developments and the existing socio-economic & political situations.

In the protein-hungry areas of the semi-feudal and semi-colonial countries of the III world, no real and practical solutions are possible without a revolutionary overhaul of the local socio-economic and political base; and other suggestions and actions are only misleading, dangerous and harmful.

In the industrialised countries, of greatest importance are the struggles against the super-market & consumer ideologies and against the monopolising hold of the techno-corporations over the local and world economies, beside a serious attention to cheaper animal proteins and to really higher efficiencies in animal production, to mitigate the likely adverse implications of income disparities within the local populations.

SUPPLIES, REQUIREMENTS & DEMANDS

In statistical terms

As a result of surveys and projections by various agencies and organisations, extensive data are available on the supplies available, requirements and future demands for food as determined by and based on the population and income trends. Main feature of such data, brought out in the following, are from a recent paper by a FAO Nutrition expert [1].

In the data in Table 1, average supplies are based on the total production and population figures, provided by the national governments. Mean (M) requirements are based on the physiological data for the reference man, woman and child of various ages for the given country. When the national supplies form a basis to satisfy the M requirements, in countries with marginal supplies only half of the populations may have their real requirements covered. Therefore, practical (P) requirements are calculated, as M + 20 %, to cover the great majority (97.5 %) of the populations. Both M and P requirements are only in quantitative terms for the local available protein supplies. Optimum (O) requirements take qualitative aspects also into account, providing 10 % or more of the total food calories from proteins in the diet.

It is obvious that the regions showing large quantitative (P) deficiencies of proteins are South Asia, S.E. Asia major islands, and the North, West and Central Africa, and that these very regions, with the exception of S.E. Asian islands, also show calorie deficiencies.

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1) M. Autret (1969) in Proteins as Human Food (London : Butterworths, 1970)

Mainland China and the countries in the North and West of South America show small quantitative deficiencies of proteins and calories. In terms of O requirements, all of the above regions suffer from large qualitative deficiencies of proteins, as also the Southern Asia mainland, Near & Middle East, and East & South Africa, while Brazil and Mexico & Central America suffer from small qualitative deficiencies. The rest of the world, comprising of Eastern Asia, River Plate countries of South America, North America, Oceania and Europe (including USSR), does not exhibit quantitative or qualitative deficiencies of either proteins or calories in terms of the average supplies. The significance of this region-wise survey is in forceful attention to the well known fact that the regions suffering from large quantitative and qualitative deficiencies in protein supplies contain over two-thirds of the world population, and that most of these regions show calorie deficiencies as well, covering most of the protein starved populations.

In the context of demands for protein, as part of food in general, an attention is necessary to the contribution of major foods to protein supplies in different regions (Table 2). In the densely populated parts of Asia and Africa, over 80 % of food protein is derived from vegetable sources, Some qualitative improvements appear to occur here due to diversity in the dietary mixtures, e.g. in diets with less than 15 % animal protein, better mixtures of cereals and legume pulses (South Asia, mainland China) and roots & tubers as well (W & C Africa), or in those with less legumes, a greater proportion of animal proteins to over 17 % (S E Asian islands, Near & Middle East, North Africa). Other parts of Asia and Africa show more than 23 % protein of animal origin, with Eastern Asia and East & Southern Africa having also a better mixture of cereals and legume pulses, but not the Southern Asia mainland, Among the protein sources of the animal origin, milk evidently has the most important role in South Asia, and the meat in China; fish a major role in S E Asia mainland and Eastern Asia; fish and meat in S E Asian islands; milk and meat in Near & Middle East and North Africa; and meat and fish in W & C Africa.

In East & Southern Africa, the contribution from meat is more than two fold of that from milk, and from the latter more than two fold of that from fish. In rest of the world (Americas, Europe and Oceania), over 30 % of food protein is derived from animal products, meat and milk being the major contributors. The regions, more affluent in economic and industrial terms of living standards, show a much greater share of animal protein and that too from meat, and between fish and eggs an increasing share of the latter, e.g. North American diets show only 30 % protein of vegetable origin and the rest from animal products, in which comes about 50 % from meat, 35 % from milk, 10 % from eggs and 5 % from fish.

With this background, the FAO projections of future demands for proteins in the world may be studied (Table 3). The percentage demand increase (P) for 1985 takes into account the low projections for population increases for all regions, and the 1965 deficit in actual supplies to meet the P requirements of the then populations of the protein-hungry areas, where the O demands are still greater to enable optimum qualitative improvements. Thus in summary, the demands for the vast regions of Asia, Africa and Latin America consist of more quantity and better quality of proteins, and one can safely surmise that an increase in the availability of local foods and a slight readjustment in their proportions in diets should easily satisfy the quantitative and qualitative requirements in the protein starved areas. In the industrialised and economically developed countries areas of America, Europe, Oceania, and in some parts of Eastern Asia, Southern Africa, and Latin America, the demands are for increased supplies of the present foods with half of the dietary protein coming from animal sources. However, the planners in the industrialised, affluent societies have in addition to take into account the trends in growing demands for ever increasing intake of animal products, as has been brought out in a recent survey of the OECD countries (Table 4).

Socio-economic realities of protein intake

Everybody knows that the data on average supplies or requirements or on % contribution of different foods in no way satisfy the practical needs of the people, but merely provide some basis either to the planners to work out programmes for further development or to the corrupt regimes to present farcical and deluding picture of development. In societies of wide income disparities and free market systems, it is only the purchasing capacity of the people which actually determines the state of their food and nutrition. This is reflected in all such societies, but with most obvious consequences in the economically backward ones. Among the many surveys (Table 5) attention is drawn to that from Madagascar to emphasise the point, where 93.3 % of the 5,000 families studied fell in the income group incapable of getting food protein in adequate quantities, and quality-wise they had less animal products and low ratio of protein calories in their diets. Apparently 5.3 % families were able to manage somewhat balanced diets. Against this vast majority, 0.1 % families were practically as affluent as the more affluents in the affluent industrialised societies of the West, having comparable dietary patterns of major foods (Table 2).

An overview of the world problems of protein nutrition is aptly expressed in the following : "While in countries with food surpluses people consume more than enough to cover their nutritional requirements - so much so that their present diet constitutes a monumental physiological and economic error - quite the contrary is true in those countries where supplies barely approximate requirements, where a most privileged social class is also surfeited at the same time that the underprivileged socio-economic groups do not have the means to obtain enough proteins to meet their nutritional requirements. Over and above the matter of inequitable distribution, the nation wide supplies in certain countries do not cover 'practical' or even 'mean' requirements" (Autret, 1969).

Obviously the major problem remains and continues to get aggravated as to how are we going to meet the demands and disparities intake. A review of the experts' suggestions in this direction and progress so far is evidently the first requirement.

SITUATION SO FAR

S u g g e s t i o n s m a d e f o r s o l v i n g t h e p r o b l e m

Last 25 years of the post-war world have witnessed a highly publicised increasing concern with the problems of food & nutrition in general, and of protein nutrition in particular. In different phases in referring to the frightening situation, terms and phrases like kwashiorkor, merasmus and protein or protein-calorie deficiency causing decreased disease-resistance, brain damage during the first two years or even before birth, permanent damage etc. have been commonly used. The latest is "Not only is the nutrition of the father and mother important, but so too that of mother's mother and possibly even mother's father" (New Scientist, 9 Dec. 1971, reviewing a recent report of the American paediatrician Ashlay Montagu). Recurring attentions have been drawn to needs of the vulnerable groups and of the under-privileged groups, and to the needs for healthy and productive labour forces, particularly in the developing countries, etc. etc. In this crescendo of chorus have been participating articulate and benevolent experts and missionaries, as individuals and in groups, charity and voluntary organisations, and national and international, official & non-official, agencies, including the various UN agencies. As a result, suggestions and programmes in varied forms have been put forth for solving the problems, the wide spectrum and multi-directional nature of which is evident in the following summation (For more details, one must refer, among others, specially to scores of publications of WHO, FAO, PAG, and also to various symposia reports, including the Pugwash one, held at Oberursel in May 1970).

For increase in available supplies, an expansion of production of common food commodities (cereals, legume pulses and animal products) is invariably the first suggestion. However, a special emphasis is now laid on use of the miracle seeds of high yielding and protein-rich cereals, and an increasing attention given to pig and poultry production in the name of greater productivities. Measures to reduce waste & loss are included in recommending better conservation, processing and distribution (check field, storage, milling and other losses, and use food mixes and milk extenders). Qualitative improvements by diversity in food, a common suggestion in the past, has now been supplanted by promotion, particularly of lysine fortification of cereals. Family planning remains the most important message and, from considerations of the tradition-bound, illiterate and backward nature, specially of the poor & hungry, calls continue for spreading literacy and nutrition education among them, particularly on better use of the available supplies and household resources. Social welfare measures include services for mothers & children, preference to vulnerable groups, cheap processed foods, and programmes for food distribution, free or subsidised, among the poorer classes and vulnerable groups.

Suggestions have been made for training manpower to serve the national requirements for food & nutrition, and to disperse and develop the knowledge further, with high priority for high standards of education & research and adequate measures for checking the brain drain. Research & development (R & D), having been emphatically presented as the essential pre-requisite for all progress, finds special mention. Integration and coordination of national research, cooperative and collaborative research on regional and international levels, and participation & involvement of experts and specialists in formulation of policies and execution of programmes have been forcefully emphasised. Special recommendations have been made for research on nutritional status, physiological aspects, and psychological & sociological factors.

In view of urgency of the problems, calls have been given to innovate to mibilise all resources of science & technology to create new protein rich foods and to derive the utmost benefits from hitherto unutilised resources to feed mankind. In this area fall the R & D studies on oilseed residues (soybean, groundnut, cottonseed, coconut and others), leaf proteins, single cell proteins based on petroleum or natural gas hydrocarbons, microbial proteins, amino acid production, and the new and recent developments in utilisation of novel proteins as textured vegetable proteins (TVP).

To present a socially conscious objective image, the expert suggestions also cover the socio-economic aspects. Calls for land reforms continue to be there. For improved nutrition through better distribution and more equitable sharing of the available monetary and food resources, increase in purchasing capacity from increased per capita income and reduction in unemployment have been suggested. To facilitate multiple target planning, beside land reform, even the social control of production & distribution and nationalisation of capital have been suggested as possible measures for solution of the food & nutrition problem, as part of the solution of the problems of underdevelopment. Relaxation of trade barriers and more liberal trade policies on the part of rich countries have also been recommended. In passing, some attention has even been drawn to the 'commerciogenic malnutrition' from the displacement effects of breast feeding and other factors, particularly in the urban areas, with special reference to unrestricted promotion and use of sophisticated, but nutritionally inadequate, processed foods and the costly infant foods.

Practical progress

These suggestions, with great concern for the problems of the protein-hungry world, appear as laudable and highly commendable ventures. But practical progress in overcoming the problems, instead, has been far from encouraging. For the problems in India, the second largest populous country with one-fifth of the world's population, the eminent FAO nutrition expert has to say the following : "Past experience has shown that in

respect of India for instance, even with the most optimistic prospects for a rise in individual income, protein consumption toward 1975 will only have risen by one third; and in 1985 by only two thirds of the increase envisaged in the practical requirements. According to these calculations, an additional 25 years of sustained economic development would be necessary to attain a production level such that the great majority of population will have an adequate protein intake". (Autret, 1969). One must realise that even this assessment refers only to p e r c a p i t a data, in no way satisfying the real practical needs of the vast mass of underprivileged in free enterprise and market economy social systems. The socio-economic content of the problem shown in Table 5, has only been further aggaravated by the reported worsening of the situation in widening the disparity in income and living conditions. A particular attention may be drawn to the recent illuminating report of the UN Commission for Social & Economic Development in Asia (1970). which lays bare the general economic and social situation in the most populous region of the world.

A great emphasis has been laid on the special rôle of science & technology in solving the problems and special efforts demanded in that direction. For an objective analysis of the implications of progress in this respect, let us again refer to the Indian situation, bearing two essential points in mind: 1) India is a country with over 70 % of its population in rural areas, largely of subsistence agriculture, and with the family income pattern resembling closely that of Madagascar shown in Table 5; and 2) positive features of any scientific & technological development must be seen only in terms of increasing the production of basic raw materials, widening the availability of food material and/or product among the common people, and increasingly self-reliant social and economic development, with the latter clearly reflected in decreasing dependence on the socalled foreign assistance in the form of investments, loans and inflow of technology under overt/ covert foreign pressures.

In India, green revolution does increase some food production in some parts of the country but, unaccompanied with changes in land relations, also widens the socio-economic disparities within those parts and between different parts, and suffers from inherent limitations of classical crises arising from depressing markets. Miracle seeds of the high yielding cereals specially wheat, increase its area and production, displacing to some extent other food crops, and particularly the legume pulses which fail to receive serious attention even of the experts. Efforts at introduction of soybean are full of possibilities of deepening the protein crisis, by displacement of pulses, and also the oil crisis, by displacing the major oilseed groundnut crop. Promotional programmes for lysine fortification of cereals further supplant the role of legumes.

In some metropolitan cities, modern bakeries installed with foreign assistance do meet demands, but of very small sections of the relatively better off and in no need of more nutrition, against the vast majority of habitual rice or non-leavened bread eaters who are also incapable of paying the high price for modern bread with greater nutrition. Milk supply schemes do meet some urban demands, but also in their sophisticated collection process by making milk a cash commodity and displacing the local consumption even of butter milk, create nutritional problems in the rural areas. They are already getting evident in some areas in their bearing upon the height & weight percentiles of children. Efforts are under way to extend the urban milk supplies with skim milk powder, mainly imported, and also in some areas with vegetable protein isolates, using sophisticated equipment commonly under foreign collaboration. Also are being produced under foreign subsidiaries and collaborations, costly milk powders, condensed milks, and baby & infant foods. Production of cheap Indian MPF (Multi-Purpose-Food), based on local raw materials, is slackened with distribution of the American CSM (Corn Soya Milk) coming into fore. Some edible grade groundnut flour is produced, but for protein-rich biscuits and for export, Improvements in rice milling techniques have led to some modernisation of rice mills, but by importing sophisticated modern machinery in foreign collaborations.

Similar trends are likely in the dhal (pulse) milling, presently a preserve of low capital and low technology small sector, but with the latter's displacement by capital and technology intensive industries. Thus modernisation trends and technological developments do occur in India, but with an increasing inflow of foreign investment and technology under collaboration and assistance, to solve the problems of food & nutrition mainly of the better off.

Summation of the General situation

The geographic and agricultural are, in general, the first factors to determine broadly the local food production pattern and the socio-cultural food habits, and thereby influencing the food availability and consumption of the type of foods of plant or animal origin, forming the common diet. Some of the most obvious examples of this are in the customary taboos in their origin, as on pork in the water scarce homelands of Jews, or on beef in the cattle dependent economy of the Hindu Agricultural society, in which there is no taboo on milk. With social development of production & distribution patterns, instituting income disparities in free market systems, the socio-economic influences come into operation, under which costlier foods become progressively the privilege of the more affluents. The costs of foods are commonly relative to total efficiencies of their production, in terms of returns from land and/or other inputs, as generally reflected in differences between fine and coarse grains or between plant and animal foods. Animal foods being the special preserves of the rich is not a new phenomenon. Even earlier than fifteen hundred years or more in the past in India, the richest ate more meat, middle income groups had less of it but more of milk, while the poor had only cereals and legumes. In the present world, this phenomenon occurs, now, on a much broader scale within the societies and between different societies, because of wider income disparities and wider interplay of supply and demand factors.

In recent times, further influences arise from factors of technological developments. In the industrialised world, two trends are obvious. On one side, the process of labour extensive agriculture is leading to increasing grain dependence in animal production. This arises from a greater shift, in general, towards more poultry & pig production and from moving beef and milk production away from grassland dependence. The overall consequences are higher costs, particularly of meat for the obvious reasons. On the other side, the techno-corporation and monopoly character of industries promotes the inevitable super-market and consumer ideologies, increasing the dependence of people on technologically processed foods in a system of centralised production and distribution. With increasing sophistication and mechanisation, the spin-offs from technological developments give rise to needs for markets for the new products for which new slogans have to be created and fed on the mass media, already under control with promotional and advertisement payments. The textured vegetable protein (TVP) is the most glaring example of this dominant pattern of production & distribution and mass media use, with more and more profits as the central motivation.

The protein-hungry regions, still in the grip of global vested interests, follow only in the track of this pattern to serve the overall purpose. For instance, in India an increased availability of cereals, balanced with pulses, can lead to optimum mutual supplementation, and an increased intake of milk, curds, and butter milk, would provide nutritionally superb diet. But instead of trying to attack the problems in way of achieving this diet for the common man, diverse slogans are given including the needs of the vegetarian Indians (incorrect since only a minority of the high caste Hindus may not eat meat, and milk, in any case, is welcome to all), and for changing the food habits of the illiterate and tradition-bound people by educating them on needs for nutrition of pregnant women and children (again incorrect, as any grandmother or mother-in-law would be able to give calorie-protein rich recipes provided one has the purchasing capacity), etc. etc. In the name of solutions of the nutrition problems, is dished out the total approach of sophisticated technology.

Fortification with lysine and other amino acids is suggested, protein isolate production is recommended, soybean technology is introduced, research on single cell protein (SCP) is given priority, and even the TVP is brough into picture as cheap meat substitutes (and this for a highly publicised vegetarian country).

Before discussing the possible practical approaches of real value, something about the experts themselves needs to be said. In meetings and discussions and in papers and reports everywhere, some common streams of attitudes and approaches are generally reflected : Within the countries or from outside, the rich, healthy and superior 'haves' show and, by necessary urge, seem to show their benevolent concern for the poor, hungry and inferior 'have-nots'; they must take upon themselves solving the problems of the latter and giving them a better life, having the mission to do it; they assert that, having acquired from special efforts and enterprise in the past their present social, economic and intellectual status for leadership, they know from experience what is best for the poor & hungry; they have all the social, political, economic, scientific & technological solutions, and they must press them upon the needy for their betterment. Failing, they deplore the futility of trying, but remain hopeful in their own way. Read : "Just as it is a vain hope that any important improvement in distribution will be brought out on a world scale, it would be equally naive to expect redistribution according to the individual needs on a national scale. The only realistic solution therefore is to achieve a global increase in production of protein foods under conditions of universal free trade. In such, greater production combined with higher income would raise purchasing power to the point where the great majority of the population would be able to satisfy their protein requirements".
Uninhibitedly selling l a i s s e z f a i r e social economy, further "Production planning, country by country, is essential; but whatever the efforts and investments required to increase production of staple protein foods, clearly (in the emerging countries) ..... this would mean only a partial improvement .... What then ?

The answer is that we must leave the beaten track. We must innovate. All resources of science & technology must be mobilized to create new protein-rich foods or to derive utmost benefits from hitherto insufficiently utilized resources to feed mankind". (Both quotes - Autret, 1969). Amen ....
It is again science & technology, their expertise and experience.

APPROACHES OF REAL SIGNIFICANCE

There is no doubt that the modern scientific & technological achievements have the inherent capabilities of solving each and every problem, in all magnitudes, of the humanity everywhere. However, there should grow a realisation that the science & technology have no role out of context of the socio-economic & political situations and interactions. It must also be recognised that all suggestions and programmes in practical operations are bound to serve the dominant interests determining the trends of development. Since the nature and implications of demands, as influenced by respective socio-economic & political situations, differ between the less industrialised and the more industrialised countries, the two areas need to be separately considered for practical approaches to their problems.

III World countries

The UN Social & Economic Survey in Asia (1970) has focussed attention on the already obvious general situation in one region. This is prevalent in all underdeveloped countries (see Table 5). Vast majority of population is economically under-privileged and suffers from both under- and mal-nutrition, in contrast to the privileged ruling elite (less than 10 %), comprising the feudal landlords, business enterpreneurs, bureaucrats and professionals (including scientists & technologists as well). The privileged elite has not only common bonds of interest within the group, but also an intimate alliance with foreign interests, cemented by growing economic and other forms of collaborations and because of a continuing intellectual heritage of past & present education and of the over-riding motivation of self aggrandisement.

Because of socio-economic & cultural alienation, this group reflects in relations with the vast under-privileged masses the typical attitudes of the superior 'haves' for the poor, hungry and inferior 'have nots', somewhat comparable with the attitudes of whites for the blacks, or sometimes even surpassing that. In all spheres of social, economic and political life in the country, this elite section of the population holds sway and, therefore, all programmes & activities are directly or indirectly managed and operated by it. Under whatever slogans or phrases presented, such activities go on serving the interests of this group, as against those of the vast masses. These are well known situations of the semi-feudal societies. In the present world situation, the local ruling elite of the semi-feudal societies cannot operate independent of the world dominant economic interests, comprising the expanding and monolpolising techno-corporation & industrial complexes. The resultant complex situation of inflow of investment and technology (redundant & obsolete in home lands) and exploitation of cheap labour, do give benefits to the economic interests trying to dominate world markets, with some dole to the local elite of the semi-feudal & semi-colonial society. But this situation in no way ameliorates the condition of the vast masses, as already evident, and would only aggravate it further by the growing economic crises, signs of which are erupting everywhere.

So far this situation persists in the underdeveloped countries, it is obviously not possible to either solve the present problems of food & nutrition, including those of proteins, or effectively meet the growing demands, particularly of the largest sections of the society in the greatest need.
No amount of 'selfless' and voluntary efforts on the part of missionary youth and experts, nor benevolence or charity in pity on the part of rich, nor even the 'liberalisation' of capitalism as some modern radicals presume, and neither any of the miraculous solutions from scientific & technological achievements can, in the present situations, lead to positive developments.

Unless the under-privileged, undernourished and malnourished people themselves wake up and consciously struggle for their rights and betterment, all other actions would further benefit the privileged few and only prove to be demagogy, self-defeating and subservient to the growing and expanding demands of the techno-corporation and industrial complexes. The first and essential tasks of the vast under-privileged masses in the under-developed countries are undoubtedly to capture the political power, overthrowing the corrupt ruling elite of the privileged groups subserving the foreign interests. Only after that, any positive and effective socio-economic development and fruitful application of science & technology would be possible in solution of their problems. Sincere and honest sympathisers, local or foreign, must recognise the real significance of the existing social, economic and political situations, must realise that no real and practical solutions are possible without a revolutionary over-haul of the local semi-feudal and semi-colonial base, and must, if anything, consciously assist this process, instead of obstructions by misleading, dangerous and harmful suggestions, slogans and programmes.

Industrialised countries

The growing demands of the expanding and monopolising techno-corporation & industrial complexes and the inherent super-market & consumer ideologies, as part of the system and through it, go on creating problems even in the home lands, i.e. the industrialised countries. This is increasingly being reflected in the growing evidence of socio-technological paradoxes, economic crises, environmental problems and the human, social & psychological, problems. Although the increasing affluence in these countries eliminates the types of under- and mal-nutrition, prevalent in the underdeveloped countries, the problems do exist and need to be assessed in the context of developing trends.

On one side, no doubt that a gross physiological & economic error continues to be committed in the form of such high proportions of foods of animal origin, more particularly meat, and still increasing demands for the same.

But is it not the resultant of an uninhibited trend of promoting and developing attitudes, fanned by the free enterprise and market economy system ? It should be obvious that, instead of slogans of nutritional education of the people in that under-developed world, false and misleading as they are, there is a great need for serious nutritional education of the people in the industrialised countries. But this suggestion is meaningless, unless it is linked up with the need for a change in the super-market & consumer ideologies, which continue to be nurtured through mass media and other promotional campaigns. On analysing the determinant forces at the back of super-market ideologies and mass media control, we would again come back to the socio-economic & political factors of the industrial complexes and monopolies.

On the other hand, the cost of foods of animal origin is rising, out of pace with the income rise. This has its own implications in the existing disparity of income and in the growing economic crises within the industrialised societies. The costs of such foods rise in market systems from the traditional interplay of the factors of demand & supply, as aptly brought out in the trade imbalance projections by the FAO (Table 6). A short supply and the consequent high cost of foods of animal origin, particularly of meat, would only lead to diversion in their consumption away from the low income groups to higher ones in these countries. As commonly known, even otherwise these foods are costlier because of the inefficient conversion of feed into food. Besides, the cost factor is now being further complicated by the technological paradoxes, evident in increasing use of grain in production of foods of animal origin, specially in the industrialised countries. In the OECD projections of trends for this part of the world, the grain ratio in feed for production of various animal foods in the Netherlands, for example, is to increase from 1962 to 1985 as follows : Pork meat, 0.596 to 0.630; Poultry meat, 0.700 to 0.680; Beef & Veal, 0.113 to 0.174; Milk, 0.115 to 0.170; and Eggs, 0.730 to 0.700.

Most remarkable is the very great increase in the grain proportion in feeds for the ruminants (beef and milk producers), and some increase in that in pig feeds. No increase of grain in poultry feed is no consolation, because of a rapid rise in poultry meat production & consumption causing very great increases in grain use in feeds. This is very clearly brought out in Table 7, giving projections on grain imports, feed use, and production & consumption of foods of animal origin.

It is not that the problems of increasing costs of foods of animal origin are so intricate as to be unknown to the experts and producing & manufacturing concerns. But the solutions suggested by them invariably, consciously or unconsciously, arise from and lead to efforts in enhancing profits and safeguarding the system, the intricate social system operated by and in the interest of corporate, industrial complexes and monopolies. Otherwise how could one explain paying subsidies for not cultivating land, for destroying the standing crops, or for giving up small farms for eventual conversion into big ones, etc. Technological developments and spin offs give rise to needs for markets for new products. Dairy butter goes in cold storage to maintain the price level, till it is spoiled and fed to animals, and side by side a promotional campaign is mounted for hydrogenated vegetable oils with high unsaturated fatty acids, etc. in the name of better nutrition. Cost of meat rises, but instead of looking for effective means to increase total efficiency of production by decreasing grain dependence, programmes are undertaken for developing and promoting textured vegetable proteins as cheap meat substitutes. Not only this, researches are going on for producing textured proteins even from milk casein, itself an animal product.

On an objective basis, for providing cheaper animal proteins and meats in the common diets in the industrialised world, a normal approach should be towards concerted efforts (research and others) in decreasing grain dependence in non-ruminant production, in increasing productivity of arable and grasslands, and in finding other ways of increasing animal productivity, etc.

Among the various suggestions, leaf protein, so much talked of in a futile manner for solving the problems of the under-developed world, could be an important approach in the industrialised countries for reducing the costs of animal products and increasing the land productivity. In integrated programmes for leaf-protein-cum-cattle fodder production, not only non-ruminant feed of non-grain origin can be produced, but even the limitation of N-input returns on grasslands be overcome. Leaf protein/extracts can satisfactorily replace grain and oil-seed constituents of pig & poultry feeds and also milk in beef calf feeds.

Non-protein N enrichment of the low protein cattle feeds with urea or other chemicals is an important area not getting adequate attention.

Single cell protein (SCP), from petroleum or natural gas, may have great potentials in increasing the animal production, but extreme care is necessary for rigorous tests on residual toxicity, before its commercial use of promoted, and extreme cautions are needed. And of course, if there is a really social concern for cheap and better nutrition, the promotional campaigns under the control of the ruling economic interests could be mounted for greater use of fish and dairy and even for greater production and use of legumes in the common diets, as against allowing the growing trends towards increasing meat and talking of substitute animal products of technology.

But in the industrialised countries, as well as in the under-developed countries, all questions are related to the dominant socio-economic & political interests. In the face of the overt or covert, but dominant control of the corporate, industrial complexes and monopolies over all means of production and mass media, the main issues are for recognition of the real nature of problems and their solutions. For really purposeful and socially useful progress, the experts everywhere must, instead of suggesting solutions of the problems world over and particularly of the less-privileged others, start looking at the problems around themselves within their own countries in the real socio-economic & political context and in their real effects on the common man.

Otherwise, the protein problem would continue to be built up as a genie, nowhere closer to solutions, but only further aggravated and increasingly acute in the end affecting and engulfing all of them as well.

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TABLE 1. Average supplies and requirements per head per day.

	Supplies (1965)		Requirements			
	Cal.	Protein (g)	Cal.	Proteins (g) M	P	O
FAR EAST (incl. China Mainland)						
South Asia	2,020	49.4	2,230	49	59	63
S.E. Asia Major Islands	2,040	40.7	2,040	42	50	55
China Mainland	2,010	58.7	2,300	51	60	72
Southern Asia Mainland	2,180	49.4	2,170	42	50	57
Eastern Asia	2,350	75.1	2,370	53	75	75
NEAR EAST & MIDDLE EAST	2,410	71.6	2,410	56	72	77
AFRICA						
North Africa	2,100	55.0	2,350	55	66	72
W. & C. Africa	2,120	54.7	2,220	50	60	63
E. & S. Africa	2,270	64.8	2,270	53	65	73
LATIN AMERICA						
N. & W. countries of S.America	2,220	58.5	2,350	51	61	72
Mexico & C. America	2,500	66.3	2,280	50	66	69
Brazil	2,780	68.8	2,350	55	69	71
River Plate Countries	3,090	87.5	2,620	62	88	88
EUROPE						
Eastern Europe (incl. USSR)	3,180	89.1	2,690	60	89	89
Western Europe	3,020	87.3	2,680	60	87	87
NORTH AMERICA	3,140	93.1	2,520	61	93	93
OCEANIA	3,230	95.4	2,700	56	95	95
WORLD	2,380	66.1	2,370	53	66	74

M - Mean requirements of local proteins, based on physiological data (if national supplies reach this level, requirements of half of the total population would be covered) ; P - Practical requirements equal to Mean + 20 % (considered adequate to cover requirements of 97.5 % of the population);
O - Objective requirements cover P requirements to provide a diet so balanced as to provide 10 % or more of the total calories from the dietary protein (Autret 1969).

TABLE 2. Percentage contribution of major foods to protein supplies (1963-65)

	Cereals	Pulses nuts and seeds	Total vegetable proteins	Meat	Milk	Total animal proteins
FAR EAST	59.3	18.0	84.3	6.6	3.8	15.7
South Asia	64.5	19.6	87.1	1.4	9.9	12.9
Southern Asia Mainland	58.8	8.3	73.5	7.1	2.6	26.5 *
Eastern Asia	48.2	14.0	72.7	6.1	2.7	27.3 *
S.E. Asia Major Islands	64.4	7.4	82.6	7.1	0.7	17.4 *
China Mainland	57.8	20.3	86.1	10.0	0.5	13.9
NEAR AND MIDDLE EAST	67.8	6.7	80.1	8.0	9.5	19.6
AFRICA	54.7	15.7	81.4	9.2	4.8	18.6
North Africa	69.9	5.1	80.3	7.8	9.5	19.7
West & Central Africa	51.2	18.1	85.7 **	6.8	2.0	14.3
East & Southern Africa	55.1	15.6	76.9	12.5	6.6	23.1
LATIN AMERICA	39.8	16.9	64.3	18.3	12.7	35.7
Brazil	37.9	26.6	71.8	13.5	10.2	28.2
Mexico & C. America	44.3	18.2	67.9	12.7	14.9	32.1
N. & W. countries of S. America	41.0	8.5	61.8	18.8	13.2	38.2
River Plate Countries	32.7	2.5	42.3	41.0	13.0	57.7
DEVELOPING COUNTRIES	57.2	16.8	81.4	8.3	5.4	18.6
EUROPE (incl. USSR)	36.2	3.8	51.5	21.5	18.8	48.5
Eastern Europe	50.0	3.0	63.6	16.4	15.1	36.4
Western Europe	33.5	3.9	48.4	22.8	19.8	51.6
NORTH AMERICA	17.6	4.6	30.1	36.3	24.9	69.9
OCEANIA	24.9	2.2	33.1	36.8	22.5	66.9
DEVELOPED COUNTRIES	31.9	3.9	45.8	25.4	20.4	54.2
WORLD	47.9	12.1	68.2	14.7	10.9	31.8

* 15.4-15.6 % from fish; ** 14.8 % from starchy roots and tubers.

TABLE 3 _ 1985 - Demands for increase in total protein supplies to meet practical (P) and objective (O) requirements

	Demand increase (%) over 1965	
	(P)	(O)
FAR EAST		
South Asia	193	207
S.E. Asia Major Islands	214	236
China Mainland	153	184
Southern Asia Mainland	166	190
Eastern Asia	133	
NEAR & MIDDLE EAST	172	184
AFRICA		
North Africa	216	236
W. & C. Africa	186	196
E. & S. Africa	161	181
LATIN AMERICA		
N. & W. Countries of S. America	187	221
Mexico & C. America	190	200
Brazil	177	184
River Plate Countries	138	
EUROPE		
Eastern Europe	124	
Western Europe	112	
NORTH AMERICA	135	
OCEANIA	153	
WORLD	151	170

TABLE 4. Trends in per capita intake of calories and proteins in OECD countries

	All Products				Products ** Studied			
	Calories *		Proteins		Total protein		Animal protein	
	(1957)	(1963)	(1957)	(1963)	(1963)	(1985)	(1963)	(1985)
Canada	3,068	3,020	94	92	76	78	52	57
U.S.A.	3,112	3,081	90	89	78	78	60	62
France	2,706	2,797	96	105	87	90	53	64
Germany	3,014	2,954	81	80	72	75	47	56
Italy	2,464	2,773	73	80	67	76	24	41
Netherlands	3,085	3,189	85	85	76	78	48	56
Ireland	3,452	3,484	95	92	80	80	47	56
Norway	3,110	2,931	86	82	67	65	39	41
Sweden	2,958	3,000	83	83	72	73	47	52
United Kingdom	3,259	3,273	86	90	76	77	46	53
Greece	2,933	2,886	94	93	76	80	28	44
Spain	2,526	2,849	70	79	58	59	19	31
Yugoslavia	n.a.	3,045	n.a.	98	87	92	24	39
Japan	2,174	2,292	73	78	43	56	7	23
Australia	3,230	3,150	90	90	83	83	58	62
New Zealand	3,390	3,507	103	110	101	98	72	72

* Excluding alcoholic beverages

** Cereal, rice, potatoes, sugar, meat, eggs and dairy products.

Source : Agricultural Commodities - Projections for 1975 and 1985 (OECD, Paris, 1968)

TABLE 5. Nutrition levels by income class

Family Income/ Expenditure Group	Percentages of families	Calorie intake Cals (per capita)	Protein intake Grams (per capita)	
LATIN AMERICA				
B r a z i l (1960/61) :				
Annual family income (new cruzeiros per year)				
Urban areas :			Total	Animal
under 100	4.16	1.315	35.6	(10.5)
100- 249	21.94	1.788	49.1	(15.1)
250- 499	31.48	2.227	66.9	(25.6)
500-1,199	30.54	2.830	95.7	(40.1)
1,200 and over	11.88	3.569	119.9	(65.1)
Total average		2.345	73.2	(31.2)
Rural areas :				
under 100	7.94	1.755	50.0	(13.2)
100- 249	27.30	2.267	64.9	(21.7)
250- 499	29.68	2.577	75.9	
500-1,199	24.56	3.144	95.4	(39.1)
1,200 and over	10.52	3.674	116.6	(52.5)
Total average		2.083	80.6	(31.0)
C o l u m b i a (1956-62) :				
'very poor' rural		1.535	30	(9)
'very poor' urban		1.538	34	(15)
'middle class' rural		2.138	52	(22)
'middle class' urban		2.183	60	(31)
M e x i c o (1958/59)				
'very poor' rural		1.788	45	
'very poor' urban		1.803	51	
'middle class' rural		2.275	57	
'middle class' urban		2.331	64	
P e r u (1951-58)				
Mountain area		1.754	47	
Coastal areas		2.205	64	
ASIA				
C e y l o n				
Rural (1961-66)		1.864	44	(8.3)
Upper class Colombo (1957)		3.271	84	
I r a n				
Landowners		2.658	74	
Urban wage earners		2.132	65	
Peasants		1.842	60	

TABLE 5 (Cont'd)

Family Income/ Expenditure Group	Percentages of families	Calorie intake Cals (per capita)	Protein intake Grams (per capita) Total	Animal
I n d i a (1958)				
Maharashtra State				
Expenditure per capita (rupees)				
Urban and rural areas :				
0-11	21.3	1.340	37.9	(1.4)
11-18	18.9	2.020	56.6	(2.6)
18-34	20.7	2.485	69.0	(6.6)
34 and over	39.1	3.340	85.7	(11.9)
Total average		2.100	59.7	(4.5)
AFRICA				
M a d a g a s c a r (1962)				
Income ('000 fr. per family/ year) :				
1- 20	54.7	2.154	47.3	(5.5)
20- 40	27.7	2.292	54.1	(8.5)
40- 80	11.0	2.256	53.6	(9.4)
80-130	3.8	2.359	61.2	(15.2)
130-190	1.5	2.350	59.1	(15.2)
190-390	0.8	2.342	64.6	(21.8)
390-590	0.3	2.456	65.4	(23.6)
Other classes	0.2	>3.000	71.2	(43.5)
UAR (1965)				
Low income class		2.204	71	(15.0)
Middle income class		2.818	84	(18.0)
Higher income class		3.130	98	(37.0)
T u n i s i a (1965-67)				
Dinars per person				
Rural areas :				
less than 20	8.2	1.782		
20- 32	16.2	2.157		
32- 53	30.8	2.525		
53-102	32.4	2.825		
102-200	10.9	3.215		
200 and over	1.5	3.150		
Total average		2.609		

Source : The Employment Problem in Less Developed Countries - A Review of Evidence By D. Turnham (OECD, Paris 1971)

TABLE 6. Net trade balance (1961-63) and projections (1975)

	Net trade balance (1961-63)			FAO projections (1975)			
	Develop-ing coun-tries	USSR & Eastern Europe	Rest of the world	Develop-ing coun-tries	USSR & Eastern Europe	Rest of the world	World
Milk equivalents (thousand tons)	+3,546	-481	-3,065	+25,761	-975	-6,022	-18,764
Butter fat (eqvts) (thousand tons)	+128	-15	-113	+1,147	-35	-233	-879
S.N.F. (equivalents) (thousand tons)	+522	+4	-526	+2,650	-70	-1,291	-1,289
Meat, total (thousand tons)	-603	-65	+696	+1,597	+590	+791	-2,978
Eggs (thousand tons)	+32	-141	+98	+115	-71	-6	-38

Source : - Agricultural Commodities - Projections for 1975 and 1985 (FAO, Rome, 1967); China not included; (-) indicates exports in case of the regions and a deficit balance for the worl (+) indicates imports for the regions and excess balance for the world; only low FAO projections included.

TABLE 7. Grain imports/feed grain use and production & consumption of foods of animal origin in the Netherlands.

	1961 - 63	1985	% increase
	(thousand metric tons)		
Bread grain import/feed use	1,106/676	613/628	(-)56/(-)93
Coarse grain " " "	3,094/3,140	3,974/4,472	128/142
Total grain " " "	4,200/3,816	4,587/5,100	109/134
Beef & Veal production/consumption	274/260	323/390	118/150
Pig meat production/consumption	420/286	749/499	178/175
Poultry meat production/consumption	97/32	269/139	278/435
Total meat prodn/consum.	791/578	1341/1028	170/178
Eggs production/consumption	336/164	251/211	(-)75/128
Butter fat production/consumption	269/578	351/214	130/(-)37*
Milk solids, non-fat production/consumption	617/467	771/631	125/135
Total dairy products	886/641	1122/845	127/132
Total animal products	2013/1183	2714/2084	135/176

Source : Agricultural Commodities - Projections for 1975 & 1985 (OECD, Paris, 1968).

* apparently cholesterol hysteria.

R A P P O R T   2 4

SURVEY REPORT ON LEAF PROTEIN PROJECT WORK DURING 1971 AND 1972

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SURVEY REPORT ON LEAF PROTEIN PROJECT WORK DURING 1971 AND 1972

1971

Late July to early October	Preparatory work involving: drafting project outline, discussion thereon; further suggestions and details on different aspects of project work in the immediate context (ref. Singh's notes of 27 July, 23 August, and 3, 15, 22 & 23 September, and the meetings on 19 August and 4 October).
Mid-October to December	Pulper delivery and some trials (ref. Singh's note of 29 October); Belt-Press delivery, Pulper and Press installation in alignment; Pulper connection readjustments, some more trials.

1972

January to April	Trials and readjustments of belt tension on Press; some trials, including ammoniation of grass and pH adjustments; devising juice clarifying centrifuge system and working out juice straining arrangements; discussions on other necessary and accessary equipment, viz. heat coagulation contrivance, pumping system, filtration/centrifugation devices for separating coagulated material, vegetation washing and chopping arrangements, mechanical pulper feeding and ammonia injection systems; discussions with Prof. S. Iwema and the report thereon (ref. Singh's note of 11 April).
May	Visit to Lund (Sweden), discussions at Alfa-Laval and the University Chemical Centre & Plant Physiology Department, and the report thereon (ref. IBVL INTERN RAPPORT 373); some trials with chopped grass;

1972 (contd.)

June to August	Some practical confrontation of the Laboratory & Technology co-workers with material, processing and product (Appendix 1, Summary of preliminary experiments); Singh's visit to India (2 July to 6 August); adjustments of Hopper feed speeds, and readjustments of belt-tension, pressed residue screw and motor on the Press.
September to December	Singh's visit to Paris, paper "Perspectives in Leaf Protein Technology" at the Chemical Engineering in the Service of Mankind symposium, and participation in discussions therein (ref. Singh's report of 18 September, to be issued as IBVL PUBLIKATIE 258); steam injection system incorporated; filter stockings and beam press system tried; available basket centrifuge adapted for coagulum separation; discussions on associated problems; trials by the Technology coworkers (Appendix 2); Group meetings revived (ref. meetings on 3 & 19 October, 8 November and 15 December); discussions on cost estimates prepared by the Technology group (ref. Singh's comments of 2 November); caution against animal trials (ref. Singh's note of 20 November); collaboration with the University Food Technology Department; research training of students, one on the chemical side and the other on the technology aspect (Appendix 3).

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APPENDIX 1

ORIGINAL
(REPRODUCED)

Ref. Note at the Group meeting on 8 November 1972:
(from lab. co-workers - A. Nieuwenhuis)

Summary of preliminary experiments June - August 1972

A. First experiments (with meatmincer, not continued) were carried out to get reproducible results in precipitation with TCA, etc. 200 ml of juice proved to be necessary.

MCM = Maximum amount of Coagulable Material obtained by TCA precipitation + drying.
CM = coagulum, etc.

B. All (preliminary) conclusions mentioned below are based on parallel experiments with similar samples of untreated juice or grass, in view of possible differences between them, e.g. in MCM: from 1 --- 6% (calculated on juice).

(1) grass pre-treated with steam: ---> loss of MCM in juice from 30 to 70%
---> temp.

(2) Coagulation of juice with steam at different temperatures:
----> CM approaching MCM
--> temp.

(3) Centrifugation of juice before (without) special treatment for coagulation: ----> CM ⇉ 50% of MCM containing ~ 10% less protein

(4) Effect of storing the juice for a few days at low temperature on MCM (and its protein content): ----> None.

(5) Effect of storing the juice for a few days at low temperature after treatment with ammonia to pH 8.5: ----> None.

APPENDIX 1 - (contd.)

(6) Typical example of the experimental yields (material balance):

26.2 kg of grass --> 11.75 kg pulp (pressed residue)
(wet material after drying = 2.8 kg)
+
12.26 kg juice (containing 5% dry MCM of 50% protein).

(7) The "pulp" (pressed residue) contained generally 18% protein after drying; and the juice residual after centrifuging MCM: 15%.

APPENDIX 2

Results of leaf protein extraction test runs in autumn 1972

Subsequent to preliminary confrontation with materials, processing and product (Appendix 1), some test runs were made particularly by the Technology coworkers. The details on processing, material balance and various analyses were made available in the Group meeting on 15.12.1972, which form the basis for the following presentation of results & discussion.

A test run commonly involved the following operations: chopping, pulping, pressing, steam coagulation of proteins in extract, and separation of coagulum on a makeshift basket (perforated) centrifuge. In two test runs, the residue from first pressing was repulped and pressed for possible improvements in extraction.

PRIMARY INFORMATION

Primary information on test runs is given in Table 1

TABLE 1. Leaf protein extraction test runs - autumn 1972.

Dry matter (DM) and nitrogen (N x 6.25 = crude protein, CP) were determined in the vegetation used and in the pressed residue. DM and CP for juice were calculated from the difference between vegetation and pressed residue quantities. Coagulated leaf protein concentrate from grass was taken as generally having 50% protein of dry matter, while the protein in LPC from sugarbeet tops was determined (Nx6.25).

	Vegetation			Pressed residue			Extract			Leaf protein concentrate	
	Total used (kg)	DM (%)	CP of DM (%)	Total got (kg)	DM (%)	CP of DM (%)	Total got (kg)	DM (%)	CP (%)	DM (kg)	Protein (kg)
Grass											
13.09.72	178	12.2	22.0	78	19.9	16.6	100	7.5	2.5	1.16	0.58
21.09.72	107	14.7	18.7	55	22.8	15.0	52	6.2	2.0	0.88	0.44
25.09.72	117	16.3	19.0	65	22.6	16.5	52	8.6	2.3	1.27	0.64
28.09.72	39	17.7	22.8	20	22.2	18.7	19	12.8	3.9	0.53	0.27
5.10.72	95	19.3	20.1	45	23.7	17.1	50	15.2	3.8	1.52	0.76
24.10.72*)	120	22.4	15.8	76	26.0	13.0	44	16.4	3.8	2.07	1.04
26.10.72*)	96	21.4	14.7	60	24.9	12.1	36	15.7	3.8	-	-
Sugarbeet tops											
16.11.72	60	12.0	21.0	17	11.5	21.5	43	12.2	2.5	0.46	0.25
23.11.72	81	11.8	15.4	31	17.0	13.2	50	8.5	1.6	0.39	0.17

*) Pressed residue was repulped and pressed.

Extraction data

With a view to have a systematic appraisal of the results and for an apt comparison with the results from other laboratories, extraction data were calculated from the primary information in Table 1, which are presented below in Table 2.

TABLE 2. Extraction data calculated from Table 1. All values are given as percent(%)

	Extract yield (from fresh vegetation)	LPC-DM yield (from fresh vegetation)	Coagul/total in juice DM/DM	Coagul/total in juice Protein /CP	Extractability from vegetation DM/DM	Extractability from vegetation Coagul DM/DM	Extractability from vegetation CP/CP	Extractability from vegetation Protein /CP	Extract Protein /veget. DM
Grass		(all	per	cent	values)				
13.09.72	56	0.65	16	24	33	5	49	12	2.50
21.09.72	49	0.82	28	42	21	5.6	36	15	2.80
25.09.72	45	1.10	28	53	24	6.7	34	18	3.35
28.09.72	48	1.36	22	36	35	7.7	47	17	3.65
05.10.72	53	1.60	20	41	42	8.3	51	21	4.15
24.10.72 *)	37	1.73	29	61	27	7.7	40	24	3.85
26.10.72 *)	38	-	-	-	-	-	-	-	-
Sugarbeet tops									
16.11.72	72	0.77	9	23	73	6.3	72	17	3.49
23.11.72	62	0.48	9	21	45	4.1	53	11	1.75

*) Pressed residue was repulped and pressed

Compared with published and unpublished results from other laboratories in the world, all values with reference to protein yields and extractability are low. Even the Mysore results, although using an inefficient extraction equipment, were higher. One is aware of the make-shift arrangement of various equipment for processing at present. The technology coworkers were, involved in this work on their own after only a preliminary confrontation. Hence, it is practically impossible to identify specific factors which could have been responsible for low extraction. However, a reference may be made to Singh's note of 2.11.72.

In it was mentioned, that on the basis of incidental observations of extraction trials, the low yields and values might be atributed to the following factors, independently or in combination: Incomplete coagulum separation, incomplete coagulation and separation, imperfect pressing, imperfect pulping, overall inefficient extraction and vegetation-inherent factors, which would need serious technological, chemical and/or agronomic attention.

With reference to the coworkers' comments regarding low coagulability of grass extract nitrogen (ref. report of the group meeting on 15.12.72) and the peculiarity of grasses in possibly giving such low yields, the general position may be summed up as follows. There are no reports of plants, in general, having such high non-protein nitrogen as is indicated in the results got here (See Table 2, column COAGUL/TOTAL IN JUICE: Protein/CP). For grass it must be conceded that no results are available with respect to the grass mixture used here, but individual species have been tried elsewhere which do not show such low values. However, special attention must be drawn to the results from trials with a variety of Westerwolds ryegrass by the New Zealand workers who have used similar equipment for pulping and pressing, and similar technique of coagulation, as that used here. (ref. paper MS entitled "Yields of extracted protein from *Lolium multiflorum* Lam. 'Grassland Tama' Westerwolds Ryegrass" by E.W.Vartha & R.M.Allison, handed over to us by Mr.Brusse in Dec. 1972). Their results with plants under diverse levels of nitrogen (no N to 168 kg N/ha), in summary show the following: (1) Extracted non-protein nitrogen was generally 4-7.5 % of the total vegetation nitrogen, rarely higher up to 10%, and never beyond; (2) Extractability of nitrogen (comparable to EXTRACTABILITY column CP/CP in Table 2) for 3, 6 and 12 weeks old plants was 41-69%, 34-67% and 16-59% respectively; and (3) Yields of extracted protein from vegetation dry matter (comparable to column EXTRACT PROTEIN/VEGET. DM in Table 2) again from 3, 6 and 12 weeks old plants were 16-19%, 10-12% and 4-6% respectively. From the New Zealand results, it is obvious that our values correspond generally with the low range of values from 12 weeks old plants, and that in case of coagulable protein in extract, our values are extremely low, indicating very low extraction, very low coagulation and/or very low separation of coagulum. Even if we take into account that in our case autumn grass was used and that too probably with a higher stem to leaf ratio than used elsewhere, serious possibilities of inefficiencies in various processing conditions can not be ruled out.

As suggested earlier, systematic chemical and technological attention is, therefore, necessary for having optimum processing conditions, with respect to pulping and pressing and, even more so immediately after extraction, to completeness in coagulation and efficiency in separation of coagulum. However, one must add that assumptions, what-so-ever regarding processing conditions and/or peculiarity of the Dutch grasses, have to be confirmed or rejected only by scientific tests, involving labour and systematic investigations.

Data on pressed residue

Beside extraction data, equally important is the information on pressed residue, as in Table 3, because of the importance of this product as cattle feed in integrated production programmes of leaf protein for non-ruminants and residue for ruminants.

TABLE 3.

TABLE 3. Pressed residue from leaf protein extraction test runs - autumn 1972. Yields per 100 kg of vegetation processed and relevant information on feed characteristics relative to original vegetation (values for latter in paranthesis). All values as per cent (%).

	On fresh basis			On dry matter basis					
	Yield	DM	Sand	Ash	Crude fibre	Starch equiv.	Crude protein	Protein-dig.coeff. (peps)	Feed norm CP
Grass									
13.09.72	44	19.9 (12.2)	2.8 (1.0)	7.4 (10.1)	28.5 (21.6)	55 (65)	16.6 (22.0)	69 (73)	9.7 (14.3)
21.09.72	41	22.8 (14.7)	2.3 (1.9)	6.0 (7.8)	26.4 (21.1)	61 (68)	15.0 (18.7)	71 (76)	8.7 (12.4)
25.09.72	55	22.6 (16.3)	3.0 (2.2)	6.8 (8.1)	24.0 (18.9)	64 (71)	16.5 (19.0)	75 (76)	10.4 (12.6)
28.09.72	42	22.2 (17.2)	0.3 (0.2)	7.8 (9.1)	22.8 (17.8)	64 (71)	18.7 (22.8)	81 (84)	13.9 (16.6)
05.10.72	47	23.7 (19.3)	0.6 (0.3)	7.4 (8.1)	21.7 (16.6)	68 (74)	18.1 (20.1)	82 (83)	12.2 (14.9)
24.10.72*)	63	26.6 (22.4)	1.0 (0.3)	3.6 (6.8)	26.6 (16.6)	-	13.0 (15.8)	75 (79)	7.9 (10.7)
26.10.72*)	62	24.9 (21.4)	-	-	26.0 (16.0)	-	12.1 (14.7)	-	-
Sugarbeet tops									
16.11.72	28	11.5 (12.0)	-	-	-	-	21.5 (21.0)	-	-
23.11.72	38	17.0 (11.8)	-	-	-	-	13.2 (15.4)	-	-

*) Pressed residue was repulped and pressed.

From the results in Table 3, it is obvious that a significant increase in dry matter content of the pressed residue as a raw material, compared with the original vegetation, must prove an asset in industrial drying for fodder and also in silage making. The rupture and disintegration of cell walls in pulping would no doubt further add on to the characters, beneficial in industrial fodder conservation. As a consequence of processing, there was an increase in crude fibre and a decrease in crude protein in the pressed residue on dry matter basis, but evidently with no impairment in its fodder quality, as indicated by the starch equivalent, protein digestibility coefficient and feed norm values still within acceptable range of cattle feed values.

General conclusions

Obviously much remains to be done to systematise the whole series of operations for optimum processing conditions and to put the whole project on a sound footing. More serious attention and a more active involvement of the coworkers in team, with clearly definied objectives and accordingly a clear programming, is necessary. The purpose as well as the problems have to be clearly formulated for reasonable progress and correct economic assessments. In the situations as those occurring in Holland, the validity and success of the project could be only around the aim of increasing the efficiencies of cattle fodder-cum-nonruminant feed production to make milk and beef and pig and poultry production increasingly self-reliant on the local agriculture. Towards this objective, the suggestion is to formulate a project for integrating leaf protein reaearch and development programme with industrial fodder conservation.

APPENDIX 3

Research training of students

On the initiative of Van den Berg (LH Food Technology Department) and Singh, plans were discussed for training of students around different themes of leaf protein research and development. Two students began their work late in 1972, one on technological aspects and the other mainly on the chemical side.

1. M.STRUIJS, with effect from October 1972 on a 6-month project.

Subject of study: Effects on extraction efficiencies by varying conditions of pulper speed (high and low), pre-pulp pH adjustments (bio-pH and alkaline pH) and pre-pulp mechanical processing of vegetation (chopping and bruising), singly and in various combinations, using highly fibrous grass, less fibrous Brussels Sprouts plant waste, and still less fibrous fodder turnip vegetation, as raw materials.
Struijs made use of the pulper (IBP unit) and a hydraulic press.

2. W.A.M.KERKHOF, with effect from mid-December on a 3-month project.

Subject of study: Effects of extraction efficiencies by varying conditions of pH and temperature treatments of processing tapioca leaves, dry and fresh. Kerkhof's investigations were totally on laboratory scale, using a colloid mill for pulping.
Students' work continued over into 1973.

S/dL

succeeding in extracting Pakistan's assent to its own scheme of settlement in the sub-continent: a demonstrative and illegal trial of some Pakistani POWs; dumping down of "Bihari" Muslims on Pakistan in the face of the fact that these people, originally Indians, should enjoy the freedom of acquiring citizenship of their choice, and securing the perpetual acquiescence of Pakistan in the new "realities" of India's hegemony over the sub-continent.

Imperialism is decadent and dying; neo-imperialism now attempts to take its place in South Asia by proxy, and under pretence of "Progress".

The Cod War And Beyond

NARENDRA SINGH

EUROPE is seeing intense diplomatic activity, all in the name of peace, security and co-operation. Conferences have been held at Geneva, Paris, Helsinki, Vienna. But the inherent contradictions of the super-Powers of the Eastern and Western blocs, and of the countries within the blocs continue. Frigates and gunboats have been used amidst loud professions and calls for renouncing the use or even threat of force in Europe. And this not between East and West, but between two countries of the West belonging to the same military alliance, and for practical purposes sitting on one and the same side in all East-West negotiations.

The cod war between Iceland and Britain is not new. According to the liberal British daily *Guardian* (May 21, 1972), the British Government had in the past also stuck out for the Icelandic sea limit, in 1930 3 miles and in 1958 6 miles, but after some skirmishes had lost the argument each time. In 1961, a 12-mile zone was decided upon for all practical purposes. However, since then more than 25 countries have extended their fishing limits further to check exploitation of their resources by the sophisticated vessels, equipped with most efficient technological gear, hailing from the industrially more developed countries. Iceland also imposed a 50-mile limit, banning fishing from that zone with effect from September 1972. The British decided to take the matter to the International Court of Justice at the Hague.

There was no trouble in the winter, but spring thaw in the North Sea ice led to a rapid sequence of developments in May and June this year. British trawlers, ignoring the ban, entered the area, followed by support tugs for protection against Icelandic coastguard cutters. Warning shots by Iceland's gunboats across the bows of the tugs, and subsequent manoeuvres between the cutters, tugs and gunboats became too much for the skippers responsible for the safety of the trawlers and crew. This and lack of support for their demand for naval intervention made them pull out of the Icelandic waters (50-mile zone). Neither the trawler owners nor the crew were keen on the Royal Navy because they feared reduced catches in 'box' fishing and consequent decrease in profits and wages. But the skippers' industrial action ultimately brought the Royal Navy in. Arrayed against Iceland's two gunboats and a few coastguards was the Royal British might of three warships, two tugs, two support ships, two helicopters, two RAF aircraft, guarding in the beginning only 15 trawlers.

Soon afterwards, feelings ran high and incidents increased. There was a skirmish between a Royal Navy frigate and an Icelandic gunboat; an RAF aircraft fled acrosss the space of Iceland without even informing the latter Government of the flight plan. This led Iceland to ban the RAF from using her airspace and airfields, and to give the British a 48-hour ultimatum to get out from Icelandic waters. There was an angry anti-British demonstration by 5,000 people, following which the British Embassy in the Icelandic capital, Reykjavik, was stoned and damaged. There were charges and counter-charges after an Icelandic gunboat had fired on a trawler, with no damage and no injury to any one. Iceland made a formal request to her NATO allies for help in getting the British out. Afterwards, in one incident four ships were damaged, involving one Icelandic gunboat and a British tug and two British trawlers. A few days later, there was a collision be-

tween a gunboat and a frigate, and then again after a few days between another gunboat and another frigate.

The International Court of Justice has, as expected, given its verdict practically in favour of the British, but the Court's jurisdiction was from the start not acceptable to Iceland. Iceland has threatened to walk out of the NATO base at Keflavik.

The cod was is not just between Iceland and Great Britain, but because of the inherent contradictions of modern times, it involves the countries and blocs of both East and West.

The Combatants

The Scandinavian culture of Iceland her membership of NATO, and her current high standard of living, all tend to obscure the fact that Iceland is an under-industrialised and underdeveloped country that depends on the big Western capitalist countries for imports. The question of real rather than formal independence underlies the continuing debate in Iceland over NATO membership, relations with the European Community (EEC), and industrialisation. The present left-wing coalition Government is committed to an industrialisation policy which bans foreign majority ownership of new enterprises. There is also an upsurge of a genuine Icelandic cultural life; the struggle against the old enemies of the Swedish and Danish capitals has now been focussed on the growing Anglo-American influence.

The fish off her shores are the only real resource for Iceland and a guarantee of her economic security and her hope for development in future. In essence the right and left in Iceland may differ over NATO, over the EEC, over industrialisation, and on cultural questions, but on the fisheries issue all are in essential agreement. The fifty-mile limit has thus become the focus of all Iceland's fears and worries about its survival as an independent nation and culture.

In 1958, with no success, Iceland had asked the Europeans to stop fishing on her continental shelf, and instead buy the fish caught by Iceland and transported by Icelandic vessels, Having learnt lessons from others in Africa and South America, she had to take a unilateral decision on the extension of the fishing zone-limit. Iceland's strategy now is to maintain the cod war simmering to reduce the British catch and also the catch limitation figure in the long run in any future agreement. Her tactics are to ensure that the trawlers stay in tightly knit groups so that fishing becomes uneconomic and the British fishermen get weary of the whole business. Iceland argues that more than half of Britain's fish is caught inshore, and the British could catch the rest by extending their own fishing zone to a 50-mile limit.

The British have been fishing in Icelandic waters for several hundred years and, therefore, they consider the area to be their traditional fishing ground. Side by side, with the sophistication in navigation and fishing gear, the British have also extended into other areas, even in the distant north-east Arctic, having arranged quotas for cod catches with the Russians and Norwegians. At present there are no catch limitations from other coasts, off Norway and Greenland, but the British and also the West German trawler fleets prefer Iceland because it is nearer home and the catch is richer. The British trawler owners have expressed their determination to maintain the proportion of their total catch—45% from the Icelandic waters—and thus assert a continuing right to fish in the traditional waters.

The British Government justifies sending the Royal Navy as a necessary defensive action to protect the British trawlers exercising their lawful rights to fish on the high seas. It is merely a strategy of deterrence rather than use of force against another country, it says.

Liberal opinion within Great Britain is going in favour of Iceland, although the labour movement has come forth with a proposal to boycott everything Icelandic. However, the liberals argue mainly from a benevolent and paternalistic stand to aid Iceland, a small underdeveloped country, and plead for a compromise in the catch limitation. The scientific elite also, as represented in journals like *Nature* and *New Scientist*, have added their usual expert opinion, expressing doubts, starting an academic debate on the issue of over-fishing and related questions, and pointing to supposedly political issues. This is in their tradition of so-called objectivity, but in reality, and in effect, of faithfully serving the masters, the imperialist ruling forces.

The West Germans, exploiters in common with the British of the cod and, in addition of the redfish in Icelandic waters, were earlier giving full moral support justifying the British protective action as under international law, although not sending their navy for the German trawlers. But now there is a change. The German catch was affected by the simmering cod war. The Germans appear to have sensed the long-term consequences of the Icelandic strategy. Iceland has dangled a bait before them, of controlled fishing up to twenty miles within the new zone-limit, the area for redfish. Negotiations between West Germany and Iceland have started.

The sympathies of France appear to be on the side of Iceland. French fishermen have no interest in the area, and France would enjoy a small member of NATO taking a defiantly independent course to the embarrassment of the two big Anglo-Saxon members. But France must also share both the general concern of the big maritime States about encroachment by small nations on the high seas, and the particular concern of the European Community members about their access to fisheries.

The Scandinavians have all called upon the British to withdraw.

Denmark, however, accepts the British contention of being within international law in sending her navy to protect the trawlers, but Norway has been outspokenly critical of the British. In Norway there is strong public and political support for Iceland. Newspapers have been covering the Icelandic case and presenting caricatures of the British in cartoons—the Icelandic David standing up to the British Goliath, Norwegian shipyards have given a call for boycott of British ships. The reasons behind the Norwegian support to Iceland are both sentimental and real. Solidarity with the Icelanders who are mostly of Norwegian origin and fears from closeness of the NATO base located in Iceland, bind the two peoples together. On the other hand, Russian intentions in the potentially rich fishing grounds off the Norwegian coasts are also a source of real worry. There have already been two developments. A new interim agreement on no more than 25 Norwegian vessels at any one time fishing in the zone, off 12 miles on the Icelandic shelf, has already been announced. In addition, the Norwegian Government has annouced support to the principle of the coastal States establishing 200-mile fishing limits, a proposal for discussion at the next United Nations Seabed Committee meeting.

The European Community (EEC) has given evidence of indirect pressure on Iceland by suspending, during the latter's talks with the European Commission, that part of the agreement which covers fish products, which in reality account for 80% of the Icelandic exports to Europe.

NATO as an alliance is in a most unenviable position, because of the implications for its base at Keflavik in Iceland.* The majority of members have been reluctant to take up the issue in the NATO Council. Privately several delegations (specially the American, Canadian, Dane and Norwegian) have been very irritated by the British action jeopardising the alliance, but officially they have put equal blame on both. The British have been urged to withdraw the frigates, but they have refused to do so unless Iceland gives an assurance not to use force and not to harass the British trawlers while negotiations are on. Iceland has shown no signs of giving in. The British action has created greater sympathy among the other allies for Iceland, but no more. Earlier at the request of Iceland to the allies to stop the British Navy from remaining within the 50-mile limit, the NATO General Secretary and others had started mediatory talks. Now, with the formal communication from Iceland to the USA for revision of the agreement regarding the NATO base and with information to that effect to the NATO Council, more active behind-the-scene talks have started. There is hectic activity among the allies to resolve the issue, first in favour of retaining the base and failing that, to finding an alternative place. However, none among the likely choices. Denmark, Greenland or Norway, are keen on having the base anywhere closer to them.

Russians and Poles

To the extent the countries of the Soviet Bloc are concerned, the Icelandic cod war has led to an exposure of the contradictions resulting from the growing revisionism in the socialist economy area. No doubt, the Soviet bloc would be only too happy to see the NATO base go away from Iceland. During the period of the British-Icelandic confrontation, there was once even an unusual concentration of Soviet warships in the area, but interestingly it was not a matter of concern or worry for the NATO Powers.

Soviet bloc countries have always opposed unilateral measures by others because of their own fishing interests. The Soviet Union gave no evidence of support to Iceland during the visit of the latter's Fishing Minister to Moscow. On the contrary, evidently acting as a spokesman of the Russians and others in the bloc, Poland came out with stinging criticism of Iceland's tactics in the cod war. And this the Poles did at the end of the four-day visit by the Foreign Minister of Iceland. At a press conference, the Polish Shipping Minister said: "Poland like many other fishing nations, gravely deplored unilateral decisions to proclaim an extension of the fishery limit without consulting other nations or receiving their agreement. Not taking into consideration the opinion of others, while extending fishing limits, is a policy that leads

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* The NATO base at Keflavik, manned by about 3500 American servicemen, was opened by agreement between the USA and Iceland, the latter at that time led by a Conservative Government. Americans service and fly a fleet of aircraft equipped with most sophisticated electronic gear covering all the heavy Soviet traffic on both sides of Iceland. It is vital to the defence of NATO's northern flank and of paramount importance for aerial reconnaissance of Russian's movements from their base at Murmansk and in the Atlantic and for surveillance of the Soviet navy, air force and missile tracking. There were deep public misgivings when the base was opened. Now, it is an ace in the hands of the present left-wing coalition Government which is pledged to close it, but has been lacking the parliamentary majority on the issue with differences even within the Cabinet. Iceland has never accepted any rent for the base. Therefore, negotiations to 'revise' the agreement, formally requested, clearly turn on political rather than on financial issues.

nowhere. I have communicated this to Mr Agustsson during our conversations. Extension of fishing zone beyond 12 miles, as done by Iceland and some African and South American countries, makes it impossible to use fully the natural resources of the sea, at a time when the world food situation is not good". (*Guardian*, May 23, 1973). Side by side with the stick, the usual carrot was also shown. It was stated that economic assistance should be provided to small countries to improve their fishing, but such assistance could only be granted through multilateral decisions; the fishing States must not try to extend their continental shelf for fishery purposes. Iceland's search for gunboats to strengthen its defence was reported to have failed in Poland and the USSR.

How remarkably united in their concern for the resources and for the problems of the world are the industrially developed countries of West and East alike! They have the superior technological capacity to exploit the farflung areas everywhere in the world, even in the universe! And of course they must have the freedom for this, using their sophisticated and efficient equipment and gear and faithfully served in their pursuits, in terms of agreements and manipulations, by their elite, the technocrats and bureaucrats. To further their aims, they must unite to make more laws to check the underdeveloped nations from interfering with their rights of exploitation and exploration on the so-called high seas and virgin lands. What remarkable unity and solidarity of motives and policies between the traditional type of imperialists and the new breed of revisionist social-imperialists! This further confirms that imperialism is not a matter of choice for not only monopoly capitalism, but even social revisionism, and that it is the way of life of such societies. For protection the victims of imperialism in its modern forms have only one choice, that is putting a united front in their dealings with the imperialists, together with struggles to uproot the local forces giving ground for imperialist penetration and exploitation.

In fact, Iceland's cod war is more readily understandable as one of the continuing series of conflicts between the developed and the underdeveloped of the world over raw materials and resources, between the towns and the villages over the questions of exploitation by the former of the latter. The camp of the latter is growing stronger. Australia also supports the principle of 200 miles. Everything depends on how the Third World countries, in unity, are able to further develop and exploit the contradictions within the overall imperialist camp of the East and West.

PROSPECTS FOR LEAF PROTEIN RESEARCH & DEVELOPMENT

Narendra Singh*

A survey of leaf protein research, discussed at an international meeting in December 1970[1], revealed the following salient features: that it was possible to get yields of extracted protein in terms of 1200-2000 kg/ha in temperate regions and 3000-3500 kg/ha in the tropics, with the pressed fibrous residue still suitable for ruminant animals; that quality-wise leaf protein was comparable with soybean, or even superior, more so because of the high carotene content, and on methionine fortification or in mixtures with cereals it became nutritionally superb; and that adequate basic information on techniques and technology was available for use, adaptation and further development. In conclusion, leaf protein was potentially the most abundant of the novel protein sources, and this approach in agriculture was obviously the most efficient for food production on land, providing many fold greater yields than the conventional practices. But remarkably, to querries about practical production and use of leaf protein anywhere in the world, no categorical answer in the affirmative was possible at that time. Nor is it possible even now, with no developments of practical consequence since then. For a correct assessment of the prospects for leaf protein research & development (R & D), therefore, it is necessary to compare the developments in this field with others and to have a look at the leaf protein approaches, as presented, in retrospect.

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DEVELOPMENTS COMPARED

First suggestion on the practical use of extracted leaf protein was made by Ereky[2] in 1926, with the clear objective of making from a fodder suitable only for ruminants a protein concentrate suitable for non-ruminants. Over a decade later, Slade[3] restressed the advantage of thus partially bypassing the ruminants. Then, during the II World War search for means of British survival under the threat of total German blocade, Pirie[4] argued for use of leaf protein as human food. For two decades after the war, although some others did fiddle with the possibilities[5], only Pirie's team remained consistently engaged in leaf protein research & development (R & D). First equipment were made in early fifties and since then considerabl improvements have been incorporated in the original designs[6]. Around mid-sixties, the interest revived elsewhere with an expansion of activity in what are called the 'developing' countries, more often associated with Pirie[7], and a fresh start in U.S.A.[8], and in Hungary and Sweden[9]. More recent evidence is also there of some other laboratory-investigations in Canada, Sweden and U.S.A.[10]. However, the number of leaf protein centres/teams is still very small, literally countable on fingers, despite the 50-year old suggestion and ample evidence of tremendous potentialities inherent in this approach.

Contrast this, for appropriate comparison, with the situation in two other fields, viz. soybean based textured vegetable protein (TVP) and petroleum based single cell protein (SCP). Former is an isolation cum-modification product, promoted as a cheap meat substitute, but in no way increasing the total land productivity. The latter is a most novel product from the most unusual source, offered as a feed for animals in the industrial world and as a potential food for the poor in the 'developing' countries, but still hazardous in such uses because of the origin. There was very little research done in these fields in the past, and that too only on possibilities of gel characteristics in soy protein. In reality, almost all R & D on TVP and certainly all on SCP erupted only in the sixties. Numerous large teams got engaged in such R & D. They still continue to do so, as is evident from research literature and press reports. With no claims of more than 10-year old R & D in either case, however, large scale

production has been going on for some time and is being expanded, even in case of SCP[11].

The disparity in the magnitude of R & D activity between leaf protein and the TVP and SCP, and rapid developments of practical consequence in the latter two, reflect only the nature of support in respective fields. In fact, side by side with the highly built up and still continuing publicity on the gravity of protein problem, only such R & D projects have been getting national and international support, which are essential assets in furtherance of the profit, expansion and control motives of the capital and technology intensive monopolies and corporations. This subject has at some length been recently discussed elsewhere[12]. In our main concern for prospects of leaf protein R & D and use, we shall restrict ourselves here to this field in retrospect.

RETROSPECTIVE LOOK AT APPROACHES TO LEAF PROTEIN

Among different novel protein sources, leaf protein has for the longest period been presented and investigated as the food for humans. The urgency in Britain ended with the war and so did the importance of, and the encouraging official support to, projects like leaf protein. In the early fifties, basic information mainly from Pirie's team did prompt some interest among others[5]. This was not sustained, allegedly from the product failing in expectations, but essentially because of lack of pressures and demands from those who really determine and support the trends in research. In the meantime, however, beginnings had been made in raising the spectre of protein malnutrition, and Pirie continued his work with support from bodies professing philanthropic aims. By the early fifties, the protein problem had been given the necessary ominous significance, particularly for the 'developing' countries. As part of mounting efforts, with claims to solve the protein problem, Pirie and his associates also began presenting leaf protein as a serious and efficient approach. They happened to make a forceful use of the conventional technique of information from children feeding trials[13], main promotional weapon of the 'nutrition experts'. This became probably a turning point in the history of leaf protein. Till that time, leaf protein was of mere academic importance. Now, it became a topic

of serious debate and controversy. On one side, pressures were mounted to stop leaf protein work at least at one national institute[14], an important centre for vigorous 'protein-promotion' in the 'developing' countries. On the other, at national and international levels, the experts categorised leaf protein, without disputing its potentialities, as mere food for the future. They thus ingeniously brushed it aside from possible 'competition', by diverting attention of the governments and policy makers, and by showing inability to "accord such work a high priority or recommend the use of funds intended for assistance of developing countries"[15]. An overview of the debate on leaf protein highlights the following.

To begin with, one must point to an obsession on the part of the most serious and consistent advocates for the leaf protein to be used only for human food. They opposed and discouraged any thought of even trials for its use as non-ruminant feed from fears of the food image getting spoiled and becoming an irretrievable obstacle in eventual acceptance by humans. However, more effective were, on the other side, the expert criticisms[16], done in the name of practical approach from arguments of conventional economics, imperfect technology and consumer acceptability in market societies. The costs, acceptability, ease of production, versatility in use, etc. were required to be compared with other protein-rich sources, available or becoming available in commercial quantities and in many cases being offered on a very large commercial scale by well established companies. These other sources were identified as oilseed protein concentrates, particularly from soybean, and SCP from petroleum, and even the newly promoted fish protein concentrate (FPC). On this test, leaf protein was found to fail in economic competition everywhere, even in the 'developing' countries. Small scale village-level production, even for local communal consumption, was declared altogether impractical. This was so in the experts' judgement, because, on one side, the illiterate and primitive villager was incapable of maintaining the modern sanitation and hygiene, necessary for his own food production and use, and on the other, this type of production did not lend itself to modern industrial practices, including providing incentives for capital investment and expert managerial involvement. The problems of colour, flavour, and lack of stability and functionality, and dangers of toxicity were

added on as the usual ornaments to give strength to the expert opinions. In the opinion of an expert from a Dutch institute, vigorously involved in testing and promoting SCP and other capital-cum-technology intensive food products, leaf protein is an emotional development offering few perspectives ("Het is m.i. een emotionele ontwikkeling die weinig perspectief biedt")[17]. How simple to brush it aside from any possible competition!

The critics in their interesting dual role, on one side, engage in publicity and building up concern with the protein problem in 'developing' countries, and on the other, form the expert bodies to advise on further R & D to solve the problem and on the areas to which the 'aid' funds might be applied. Professing solutions of the problems of the under-privileged, both the advocates and critics of leaf protein are themselves beneficiaries of privileges of the socio-economic disparity, either within 'developing' countries or between them and the industrialised countries. These elite inspiringly look for transplants of the consumer societies and welfare economies, prevailing currently in the industrially developed world as historical consequences of past colonial and present neo-colonial exploitation of the 'developing' countries. Consciously or unconsciously, they gloss over the socio-economic and political realities. The expert projections of scientific, technological and management approaches have nowhere solved the protein problem. In practice, however, the dominant ideology of the profit motivated, capital and technology intensive monopolies and corporations has prevailed in determining the R & D and production trends through diverse channels and agencies, only further aggravating the protein problem[12]. In pursuits of their aims for increasing and widening control over the raw materials, processing and distribution, the leaf protein approach presently is no asset, and an overt promise is inherent in other materials and approaches, like TVP, SCP and FPC.

Therefore, it must be recognised that, in the name of solving this built-up protein problem, leaf protein research is unlikely to proliferate much beyond diversions in esoteric fiddling and or in some fund raising efforts. This would remain so unless a striking development is promised for an overtly capital and technology intensive approach to be able to subserve the neo-colonial vested

interests of the industrially developed world in parasitically exploiting the resources of the 'developing' countries of the III World. Research emphasis on dry leaves as raw materials in some laboratories is prompted by this approach[18]. Efforts to develop highly sophisticated fractionation techniques[10b] or adaptation of the somewhat older[19], particularly for processing dry leaves, may provide an incentive for research support in this direction. The new ventures [10a, 10c] also appear as urges towards it. Even the FAO/WHO/UNICEF Protein Advisory Group (PAG) has blessed this approach: "PAG recognised that further research on a laboratory and pilot plant scale into the feasibility of leaf protein sources and methods for their extraction would be desirable in appropriate institutions"[15]. (Emphasis, author's). Impressive is also a recent forecast of promising developments in leaf protein, among others, to come in due course of time[20].

Contrasted with the above-mentioned advocacy for food alone, the interest in leaf protein R & D in some countries began linked up with local needs. The work at Albany[8b] began as an adjunct to alfalfa dehydration, at Budapest[9a] in efforts to economise on imports of oil-seed meals (soybean, etc.), and at Lund-Alnarp[9b] from merger of interests between the national ventures for efficiency and self-reliance in food and feed, and exploratory moves of an international cartel for prospective expansion. More recently, it was very interesting to find in the list of papers at an international meeting a number of them dealing with mechanical dewatering or fractional treatment of forage prior to drying, with obvious leaf protein implications. As one understands, such ventures and efforts get encouragin response and support (official, financial, collaborative and academic at both the institutional and national levels[22]. However, it is not always smooth sailing because of the diversionary obstructions, in the absence of pressing demands[23].

REASSESSMENT OF OBJECTIVES AND PROJECTION OF PROSPECTS

An overall assessment clearly points to the need for a positive strategy in leaf protein R & D for socially useful and effective objectives. The main emphasis, rather the only one, in this strategy must be on the contribution of the leaf protein approach in real ... originally decades back during the II World War

crisis in Britain or even earlier[2,3,4]. In essence this refers to the most efficient use of land and other agricultural resources for self-reliant food production. The leaf protein approach, to be practical, must be integrated with, and not divorced from, the conventional agriculture aiming at progressive improvements in increasing the real production efficiencies of plants and animals on land. The essential components of leaf protein R & D should, therefore, comprise efficien processing of fodder plants and the currently unused greens of other plants, for integrated production of ruminant fodder and non-ruminant feed, and additionally, whenever and wherever feasible, for productio of leaf protein also for direct use in the common food, not for the under-privileged alone. The R & D objectives on the individual nation planes must necessarily take into account the specific conditions of the particular country to develop the most suitable approach and programme in accordance with the nature and needs of the local econom technology and people.

The greatest promise for a socially useful R & D activity and programme clearly lies in the socialist countries, like China and North Vietnam, not geared and oriented to profit-motivated consumer market approaches of the private/state controlled techno-bureaucratic corporations or complexes. They evidently have aims for really efficient use of natural and human resources in the interest of the common people themselves, without creating new privileged classes within the country or a new privileged society at the cost of other countries, and they appear determined not to permit development of the town country disparity, scourging elsewhere in the industrialised and less industrialised countries. Even the knowledge accumulated so far can be put to real practical use by these socialist countries in early stages of industrial and technological development. They can make efficient use of the principle and available knowledge of small scale technology, adapt the same for rural production and use on a collective/communal basis, developing it further in practice as part of their experiences and future needs. To begin with, the essentials of R & D programma may comprise the following. The raw materials would be all greens, available and cultivable without adversely affecting the direct human food supply. As far as possible, the immediate pursuits should aim at use of fresh, minimally processed

products, with a view to simplicity and economy in terms of processin steps and intricacies, and also in terms of inputs of capital and technological-cum-managerial expertise. The processing could be one-step to get fibre free extracts or complementary two-step to get coagulated protein concentrate from the extracts. This would depend on the nature of vegetation used, feed/feed-supplement required, and problems associated with the use of products. Quite a good amount of relevant information is available on various aspects, as results from earlier investigations, as mentioned in a preliminary note[24]. No doub the problems arising in practical programmes would need further investigations by those actively involved.

The other less industrialised countries of the non-socialist III Worl also, along the above lines, have possibilities of low-capital and low-technology involving, small community programmes for efficiently increasing the overall food production on a wider scale for a wider use by the common people. The leaf protein R & D in these countries, therefore, must vigorously aim at, on one side, developing and promoting small scale technology for village level production and, on the other, accumulating basic knowledge for application, whenever possible under more amenable social situations. Further, in the ligh of past and continuing experiences, great cautions are very much necessary against unwittingly accepting the directly or indirectly foreign-sponsored R & D programmes and philosophies, whether in leaf protein or in other fields. All such approaches must be critically examined and exposed in the context of national self-reliance and of real freedom from the grip of economic and technological imperialism However, no real progress even in this direction would be possible unless the leaf protein R & D, as any other, forms part of the much broader and more fundamental approach and struggle on a national lev in these countries, as enunciated recently in an earlier article[12].

Prospects for leaf protein R & D are also there positively in the industrially developed countries with sincere intentions towards self-reliant food production. An urgency in this direction has been forcefully posed before the socially conscious, sincere researchers, especially in Europe, by the most recent incidents of soybean politics[25]. One must leave the questions of the type of technology t the judgement of local experts. However, as a suggestion, the leaf protein R & D must aim at use of the juice and coagulated materials

in feeds for non-ruminants and young cattle, with a view to reduce dependence on imported feedstuffs and to increase the local productio and availability, and to reduce the costs thereby, of the common animal protein foods. Beyond feed uses, the possibilities of leaf protein as meat extender in human food must also be kept in mind with a view to check encroachment from soybean and the TVP from it. Other industrial countries, not aiming at self-reliant food production but persistent in pursuing their aims of parasitic exploitation of the III World resources, fall beyond the scope of this discussion.

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A bibliography of relevance to leaf protein research and development

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INSTITUUT VOOR BEWARING EN VERWERKING
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P U B L I K A T I E   2 6 1

A BIBLIOGRAPHY OF RELEVANCE TO LEAF PROTEIN RESEARCH & DEVELOPMENT

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From the mid-sixties, a revived interest in leaf protein research is evident with a number of teams starting work in different parts of the world. This development, diverse motives behind it, and the prospects of leaf protein research & development (R & D) in the socialist and non-socialist III World, and the industrial world have been the subjects of an earlier discussion[1]. As a corollary ,a need arises for a comprehensive bibliography for use of the prospective R & D workers. One is aware of the first commendable work of this type in the early stage of revived interest[2]. The book on leaf protein[3], reporting on an international meeting held in 1970, also contains a useful list of references. However, beside the fact of that meeting having a predominant food bias, a large number of papers have also since then been published. This bibliography is an attempt to overcome these shortcomings, but with a selective emphasis on literature from the mid-sixties onwards for the obvious reasons. Because of their relevance to prospective R & D, some earlier papers are also included, as well as a number of non-leaf protein papers, having an indirect bearing on the subject.

Only published and commonly available literature has been referred to, thus excluding patents, unpublished theses, etc. Also are excluded the papers on presentation and acceptability in food. The latter are of limited importance from peculiarities of national/regional food habits and tastes, and even otherwise, as results of false approach of the privileged for the under-privileged, of no practical value for use in the common food for all, wherever and whenever possible.

A careful study of the bibliography may reveal to the critical observers, the real nature and purpose of research work in progress in respective laboratories in different countries. To facilitate utility of the bibliography to researchers, the subject matter of the references has been divided into certain categories, as given after the list.

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SUBJECT-CATEGORIES

The subject matter of the references in bibliography has been divided into seven categories, to facilitate utility. The papers related with quality aspects of leaf protein have been further sub-listed, because of the diversity of the subject. Each reference is listed (and cross-referenced) according to the appropriate subject matter.

I. Survey, review, general or group papers :

7, 96, 97, 116, 117, 118, 119, 121, 129, 130, 132.

II. Laboratory investigations and techniques :

1, 6, 14, 21, 28, 29, 36, 55, 56, 64, 68, 72, 77, 79, 81, 88, 89, 90, 99, 107, 110, 113, 114, 115, 123, 127, 131, 139.

III. Engineering and technological importance :

2, 8, 10, 30, 31, 32, 33, 34, 41, 47, 52, 58, 66, 67, 69, 70, 80, 85, 86, 87, 120.

IV. Yields and productivity relevance :

5, 11, 25, 26, 62, 72, 121, 134, 135.

V. Quality aspects :

A. Analytical-composition:

16, 24, 27, 45, 50, 71, 72, 73, 77, 90, 100, 104, 109, 123, 126, 127, 131, 136, 138.

Analytical-storage characteristics:

9, 13, 19, 42, 102, 108, 122, 137.

B. Nutritive value (in vitro):

3, 18, 22, 23, 24, 48, 72, 106.

Nutritive value (in vivo):

(a) Rats :
1, 18, 35, 38, 39, 43, 48, 54, 101, 105, 106, 109, 111, 112, 123, 124, 125, 126, 127, 138.

(b) Pigs :
37.

(c) Poultry :
12, 38.

(d) Human :
92, 118.

VI. Quality of products other than leaf protein :

91, 103, 133.

VII. Non-leaf protein papers of relevance :

4, 15, 17, 20, 40, 44, 46, 49, 51, 53, 57, 59, 60, 61, 63, 65, 74, 75, 76, 78, 82, 83, 84, 93, 94, 95, 98, 128, 140.

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WHY LEAF PROTEIN RESEARCH IN A EUROPEAN COUNTRY LIKE HOLLAND ?

by Dr. N. Singh

The prospects for leaf protein research & development (R & D), with a retrospective look at the past, have recently been discussed elsewhere[1]. Therein was given somewhat more detailed attention to the promise of R & D in the socialist countries, like China and North Vietnam. Following from that, the non-socialist developing countries were also included in the scope. Because of the obviously wide disparities, the industrially developed countries were touched upon only in a general manner. Now, in the following, special attention is given to Europe, with Holland as an example from reasons of author's personal experiences, as explained later.

BACKGROUND

In the early fifties, some research interest in other laboratories in U.K. and elsewhere[1] was promoted by the basic information and projections in publications from N.W. Pirie and his coworkers at the Rothamsted Experimental Station. The work was also started in Holland[2]. The Dutch investigations were in 1958 summed up with the following conclusions : "Research on the economic possibilities of protein production through green fodder pressing has so far yielded negative results. However, from economic viewpoint it is better that one such industrial machinery is procured by the Government and thoroughly scientifically tested, rather than that through commercial propaganda a number of such press-equipment are placed on diverse farms, with which after expensive trials no satisfactory results can be got" (translated from the original in Dutch[3]).

Thereafter, evidently there was no follow-up. Neither there was scientific testing of one single industrial unit, as suggested, nor a proliferation of wasteful and expensive installations, as feared. This was so just because of the absence of any demands either from urgency for local production of such materials or from attraction of the competitive commercial interests.

The sixties have been the heyday of protein publicity in the world, around the spectre of present and future demands, and involving promoted search for new sources and processes. Although protein nutrition in Holland seemed to be no problem, the introduction of some industrially developed new protein preparations did lead the Government Minister to request the Public Health Council in 1967 to advise on the possibilities of development[4]. In the opinion of one expert[5], leaf protein still remained an emotional development offering few perspectives. However, in mid-1970 the production of leaf protein was seriously discussed at the Institute for Storage & Processing of Agricultural Produce (IBVL) as part of their expanding programme of research activities. The considerations were that proteins would become more important than they were now in this part of the world, and that, although the future developments in leaf protein could not be predicted, this possible source for practical purposes was too important to pay no attention to developments in this field[6]. Very reasonable indeed ! To have an efficient start from the level of know-how available in the world nowadays , the author was invited to give a lift to and organise the leaf protein R & D in Holland[6].The author accepted the invitation, with hopes in addition for accelerating the pace of research in furtherance of the whole concept[7].

The trend of work, beginning with late-1971 up to the end of 1972, has been presented in an IBVL report[8]. References therein are made to discussions with experts from within and outside the Institute. Not mentioned, however, is an unsuccessful request, during that period, by the IBVL Director to the Directorate of International Technical Assistance (Directie Internationale Technische Hulp, DITH) for financing from the development funds, additional research in the frame-work of the leaf protein project at the Institute[9]. Lately during this year, in the projected reorganisation of agricultural research in Holland under the growing financial stringency, there has been, as part of the general slowing down

of the green fodder research, even a threat of stoppage of the modestly started leaf protein work[10]. From this, one may sum up that the leaf protein work has started at this Institute, but again with an uncertain future, n o t d u e t o a n y a d v e r s e r e s e a r c h f i n d i n g s. In the light of these developments and the author's experiences, a serious reassessment of the prospects of leaf protein R & D in Holland, in particular, and in the industrial countries of Europe, in general, becomes necessary. In the following, therefore, after some general comments an attempt is made to reformulate the purpose and objectives of leaf protein R & D, and a programme.

GENERAL COMMENTS

In the first place, a mention must be made of the overall experience of lack of coordination and that of clarity and purposefulness, evident consequences of several factors largely beyond the scope of this discussion. Beside this, with various implications, the emphasis has remained diverted in the main to food approach, and in that around the professions of concern for others, inspite of suggestions towards developing an integrated feed-cum-fodder approach. This was reflected in discussions with the experts from outside and within the Institute, in contacts with the co-workers around, and in the request to DITH and their reply. The arguments generally demonstrated an ignorance of developments in the field, and sometimes even an unwillingness to take them into account. In criticism, in particular, the tone reflected a common pattern of thoughts and argumentations, discussed in some detail earlier[1].

In the specific context, one must again point to failure in taking into account the great disparity in the R & D inputs between leaf protein and other areas. For example, the cost-estimations for the project, done here as elsewhere, become irrelevant because of the following reasons. They begin with the results of very inadequate R & D inputs. Next, they incorporate into the projected production system specialised (non-general purpose) equipment, designed for other specific narrow aims as required within the capital-cum-technology intensive economies.

Finally, with a conscious or unconscious prejudice, they compare the whole economics and production efficiency in terms of profit in a competitive and exploitative free-market world structure. No doubt, leaf protein is considered not only uneconomic, but it even fails to get any R & D support. Thus, the problem in essence boils down to the purpose for which R & D, in general, or in leaf protein, in particular, must be supported. We are concerned here only with leaf protein, but the analysis would have a bearing on the whole question of reorganisation of agricultural research, a subject of currently great concern in Holland. The slowing down of green fodder research, basic research in potato being relegated to a low priority, and a growing emphasis, in contrast, on dry cereals and legume as new technological raw materials of significance; these are all related areas. Sincere and socially conscious researchers have to analyse reasons for all this, in their honest pursuits towards socially useful scientific research and technological developments in the interest of the common people. For some understanding at least in one case, let us go back to the question raised : Why leaf protein research in Holland ?

PURPOSE OF LEAF PROTEIN R & D

The great publicity from all platforms invariably draws the first attention to the problem of protein malnutrition. As is obvious, there is no urgency on this account within Holland, because of the historical factors leading to the current affluence and adequacy in food and nutrition. Then the focus falls on the developing countries and the need for assistance. For an analysis of the real nature of the food and nutrition problems in those countries and also elsewhere, a reference is made to other articles[11]. Therein has been exposed the fallacy of the research-oriented approach to solve such problems and that too by the research centred in, and promoted from, the industrially developed countries. Even otherwise, the leaf protein R & D, with the professed aims for progress in that direction, has failed to get official and non-official support of the national and international ruling interests. This issue has also been discussed in the earlier paper on prospects[1]. The reply from DITH[9] is an apt illustration of the failure in the present case.

Fiddling in research is usually permitted as part of the general approach with motives to build and sustain the intellectual cadre to subserve the economic & political system and the ruling interests. Such fiddling in leaf protein research has been permitted in the past. There is recent evidence of some support in this direction[1], which may further grow particularly in the light of forecasts of the type as made lately[12]. In the background of such support operate the expectations of possible spectacular discoveries, as spin-off or pay-off. They accord with the aims of developing some capital-cum-technology intensive approach for wider market control and greater profits, and as assets to exploit the cheap resources, raw materials and labour, especially available in the developing countries of the tropics and sub-tropics. However, when there is economic crisis, the axe is bound to fall on such fiddling, first in the applied research centres and in due course of time in the other academic centres and universities. Threats of stoppage of leaf protein research, slowing down of green fodder research, and a low priority to basic research in potato at the IBVL are parts of this story, in the order of their importance to the system in the present crisis of financial stringency.

Failing on the above two counts, the prospects for leaf protein R & D appear promising, only as part of the whole approach to agriculture, as an asset in the local national or regional European context. The economic arguments have continued forcing trends, on one side, towards labour-extensive agriculture and, on the other, to increasing dependence on imported food and feed raw materials. Overall consequences have been progressively decreasing productivity, in real terms, of land for food, and increasing costs of food for the common people. Most recent alarms[13] from US ban on soybean exports and the rocketing wheat prices in the Chicago exchange are mere repercussions of this situation, to only aggravate further in the absence of real amendments. Such amendments are possible only with a positive policy of promoting and supporting the local agriculture. And as part of the latter, the leaf protein approach is inherent with potentialities of reversing the growingly undesirab[le] trends with respect to misuse of the land and other resources, worsening environmental pollution and rising costs of food products. In essence, the purpose and objectives of leaf protein R & D could have only one positive direction, i.e. towards increasing the real production efficiency of food on land and through that increasing ... of supplies of cheap food, particularly of the

animal origin, in the whole by greater self-reliance on local agriculture and by providing dependable and reliable local resources for food production. This could form the only basic premise, socially useful and positively supportable, to project further the leaf protein R & D.

CHOICE OF TECHNOLOGICAL APPROACH AND ESSENTIALS OF A PROGRAMME

The three possible technological approaches comprise the following : (a) production of coagulated leaf protein for food and use of the by-product pressed residue as fodder; (2) as part of increasing the efficiency of fodder dehydration, use of the by-product expressed fluid or the coagulated material from it as a pigment-cum-protein concentrate mainly for non-ruminants; and (3) an integrated production of pressed residue for fodder and the expressed fluid and/or coagulated material from it in feed for non-ruminants and as milk-replacer for cattle, and for direct use in common food whenever and wherever possible. The last approach is the only commendable one, with no by-products, aiming at efficient use of all products of processing and involving a correspondingly integrated R & D from the start.

No leaf protein R & D programme would gain support and progress, if it is totally divorced from the local agricultural practices. Therefore, integrated with local agriculture, it must aim at progressive improvements in real production efficiencies of plants and animals on land. To begin with, a reference must be made to the draft-outline of project on leaf protein, prepared for the IBVL[14]. This was a programme for several years for a fairly large research team, involving comprehensive multi-disciplinary investigations. Later, the scope was limited to one area in the paper on perspectives on leaf protein technology[15]. With those details in the background and in the light of further developments and experiences, some essentials are presented here. The emphasis is mainly on a practical programme, excluding research fiddling towards making leaves or leaf protein industrial raw materials, and/or towards developing highly capital-cum-technology intensive approach, either of which would presently subserve only the interests of the big monopolies and corporations.

The first choice in vegetation are obviously the heavily fertilised nitrogen (N) rich fodder crops (grasses and legumes), which could permit skimming off a part of their N. This way, probably even the present limitations of N-input returns, particularly on grasslands, may be overcome. The other important sources of foliage are the greer from the various local commercial crops, e.g. potato, green beans and peas, sugarbeet, and the vast horde of other field crops, which yield in green stage some economically important (edible or otherwise) part, other than leaves. Such greens are presently, due to harvest or processing requirements, either killed on the plants, chemically or otherwise, or added to the wastes for disposal, or very imperfectly used. After suitable beginnings and satisfactory progress, certain plant-physiological and harvest studies on diverse crop plants may have to be undertaken for efficiencies in integrated agricultural production. In due course of time, even the current emphasis on soft wheat and other local grains, as raw materials for feed, may have to be revised and diverted for greater land productior efficiencies.

Technologically, the leaf protein R & D must be intimately associatec with industrial fodder production/conservation, because pressed residue is an essential product of processing. For the details of technological processing and the associated problems thereon, one is again advised to refer to the earlier paper on perspectives[15], particularly to the sections therein on extraction technology, technology of coagulation and separation of leaf protein, and the technology of processing the products further for use. Beyond that, with some new experience, two additional points need to be made here. First is a reference to the basic information contained in a recent paper[16] on mechanical dewatering, which seems to be of relevance to efforts in improving and developing the technology of pre-press mechanical pulping and subsequent pressing. Next is a concrete suggestion to explore the technological feasibility of a pre-pulp treatment with hot water, and study the implications. This would of course lower the earlier emphasis on maximum efficiency of extraction of leaf protein from the vegetation. Based on certain assumptions, to some extent already substantiated in the preliminary investigations[17], such a treatment may offer some advantages, as enumerated in the following. Partial coagulation of the chloroplastic material within the cell, consequent to hot water treatment, would leave a higher N than otherwise in the pressed residue.

Hot water treatment, accompanied with rapid pulping and pressing may yield a residue more efficient for dehydration or even ensiling, due to greater rupturing of cells and pliability of the cell wall membrane. The extract would have a greater proportion of better quality cytoplasmic proteins. There would be a more balanced fractionation of the nutritionally important pigments, carotenes and xanthophylls, between the pressed residue and coagulated leaf protein. On a practical plane, such a treatment appears in general to offer many more advantages than otherwise implied in fractionation of the extract into cytoplasmic and chloroplastic materials. Further improvements are possible, and have already been indicated[17], by use of substances like polyvinylpyrrolidone (PVP prior to pulping to check the quality-impairing phenol-protein interactions.

Obviously, not everything can be indicated before the beginnings in R & D are made. Having made the start and with some progress, the R & D workers would come across new problems which they would tackle in the light of their experiences. Before ending, however, one must again emphasise the following. As a product of integrated fodder-cum-leaf protein production, the R & D efforts must aim at the use of the latter in feeds, wherever non-fibrous protein concentrates are used, and in meat-based foods, wherever imported raw materials are used as extenders. In the end, a reference is made to a recent bibliography[18] on leaf protein for the benefit of the prospective R & D workers in Holland and elsewhere in Europe..

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